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Trade Policy, Trade Conflicts, Determinants, and Consequences of Protectionism

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Abstract

In this dissertation, I try to continue the strand of the literature on international trade. Theoretical modelling accompanied with econometrics analysis using available data assist this thesis to provide explanations on trade policy determinants and its implications. The first chapter investigates the impact of corruption on trade protectionism and trade openness as a major institutional determinant discussed in the literature. In the second chapter, a theoretical framework on welfare analysis of a prohibitive non-tariff measure (NTM) is illustrated. NTMs that have attracted global attention after drop of tariffs via international agreements such as GATT and WTO regulations are discussed in details with the special focus on technical barriers to trade (TBT). In the third chapter, quality of traded products is analyzed through various types of NTMs. In the fourth chapter, the trade disputes on TBTs are investigated as major trade conflicts in the context of WTO dispute settlement mechanism. Moreover, the determinants of these trade conflicts are analyzed using appropriate econometrics techniques and applying new data on specific trade concerns raise on TBTs. In the fifth chapter, trade frictions in services within the European Union (EU) are studied. While EU directives are regulated to provide a frictionless environment to smoothen trade between member states, tariff equivalents of trade in rail transport services are estimated. Finally, in the sixth chapter of this dissertation, detailed effects of four types of NTMs are analyzed. Using an augmented gravity framework, importer-product-specific ad-valorem equivalents (AVEs) of NTMs are calculated.

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Introduction

What to produce, how to produce, and for whom are the basic questions in economics. In order to provide correct answers to these questions, economic science has evolved and improved during centuries. Allocation of limited resources has forced societies to understand what to produce. Due to the available limited resources, people need to find a way to produce goods and services in the most efficient way in order to achieve what they desire to consume. Finally, to cover the costs associated with the production, a market mechanism is required to provide goods based on peoples' demand and willingness to pay.

Imports assisted people to produce more efficiently than before. Exports of goods provided a better mechanism for finding consumers. At present, trade in technology intensive goods and in know-how helped firms to use resources more efficiently in producing goods. Thus, international trade has been playing a significant role during the history at least since the creation of Silk Road trade routes across Eurasia. Trade has become an important tool in increasing the welfare of societies. However, history showed that the need for resources and goods desired by the societies caused many conflicts and wars, which usually destroyed peaceful trade.

The liberalization of trade and free market access to resources and products beyond borders became a need for societies. Economists have tried to acknowledge this fact using theoretical modeling frameworks. International economic theorists have tried to establish frameworks for providing sufficient and logical motivations for international trade. Moreover, they formulated policy implications providing benchmarks for exchange of goods, services, resources, and commerce that could be beneficial for all economies involved in international trade. Gradually during the history, conflicts and wars were replaced by international economic relations and trade. Governments have also established a solid framework to negotiate their mutual trade concessions within agreements and organizations established after the Second World War.

In this dissertation, I will present specific aspects of trade policy, by studying both the causes and effects of them. I will focus my analysis on certain forms of non-tariff protectionism and applications of specific trade policy instruments. In particular, I will demonstrate the interplay between traditional tariffs and specific forms of non-tariff measures (NTMs) and calculate the tariff equivalents of non-tariff measures in both manufacturing and services industries. I will also try to explain why some NTMs become an important trade policy instrument and what can be the welfare implications.

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The welfare increasing effects of trade have been widely studied in the economic literature starting by economic pioneers such as Adam Smith and David Ricardo. Smith (1776) was the pioneer but David Ricardo improved this concept by demonstrating benefits of free trade from the comparative advantage in the production of two products by two trade partners. Even if the labor productivity in one country in every good is lower than in another one, there will be a

win-win situation in trade where all workers can consume more in all trading countries (Ricardo, 1817). The simple assumptions of the Ricardian model have become more realistic, taking into consideration many other factors of productions and varieties of products, within the strand of the neoclassical literature (Stolper and Samuelson, 1941; Oniki and Uzawa, 1965, and Vanek 1968).

The Heckscher-Ohlin theorem, enhanced by Vanek ((H-OV), has constituted the framework for empirical analysis on inter-industry trade flows. Trade based on the factors of production abundance has been initially tested by Leontief (1953) leading to the Leontief paradox. Later work of Leamer (1980) questioned the Leontief findings, but subsequent studies suggested that correct interpretations would not confirm empirical validity of H-O-V theorem.

Continuous criticisms on neoclassical theories of trade have brought other scholars to the concept of New Trade Theory emphasizing on monopolistic competition, increasing returns to scale, and firms' heterogeneity (Armington, 1969; Krugman, 1979, 1980, 1981, 1987; Helpman, 1981; Melitz, 2003; and Bernard et al., 2007). This framework explains the expansion of intra-industry trade. According to the New Trade Theory, international trade should reduce average costs and prices and increase the number of varieties for consumers ("love for variety"). Hence, the traditional positive consequence of international trade focusing on lower prices is supplemented by addition benefit such as larger number of available varieties of products.

The "New" New Trade Theory has been enriched mainly by Melitz (2003), by extending analysis to the firm level. The new approach explains why and how international trade induces relocation of firms within an industry. Intra-industry trade becomes significantly an important issue, which then is followed by global value chains. In addition, international trade can improve the quality of products. Within this framework the economists are emphasizing the role of product quality, in addition to the traditional perspective on comparative advantage (Schott, 2004; Hummels and Klenow, 2005; Hallak, 2006; Feenstra & Romalis, 2014). In summing up, the new trade theories are becoming more detailed encompassing various attributes of trade and supporting consensus on benefits of liberalization in international trade.

Theories of international trade have been widely tested using various datasets by different scholars (Loertscher and Wolte, 1980; Helpman, 1988, and 1998; Evenett and Keller, 1998; Bernhofen, 1999; Cieślik, 2005, and 2009; Feenstra & Romalis, 2014).

Despite the fact, the majority of empirical studies, based on the neoclassical and new strand of the literature, confirms benefits of trade liberalization, trade policy has been frequently used as a means to control or restrict trade flows. Tariffs and non-tariff measures (NTMs), encompassing various instruments such as trade quotas, subsidies, reciprocal dumping, antidumping, technical standards, and etc. were frequently used to control trade flows.

Issues related to trade policy, its determinants and consequences have been discussed in several advanced textbooks and economic articles (i.e. Helpman and Krugman, 1989; Francois and Reinert, 1997). Grossman and Helpman (1992) in their seminal paper established a framework to analyze how governments support special interest groups, in exchange for pecuniary benefits,

by imposing protectionist trade policies. Governments are protecting the domestic industry against foreign competitors using various policy instruments. This complicated game is called "protection for sale" by Grossman and Helpman (1992). The protectionism is restricting trade and raising trade conflicts between trade partners. In general, protectionist trade policies contradict economic interests of trading partners. In order to meet concerns of partners, governments need to provide convincing arguments in the context of international trade regulations. Motivations behind different forms of protectionism are described broadly in the modern strand of the economic literature.

By signing the General Agreement on Tariffs and Trade (GATT) in 1948, the Contracting Parties decided to liberalize international trade gradually. World Trade Organization (WTO) – which was emerged form GATT and established by the end of 1994 – provides detailed international regulations on various trade aspects. The ultimate aim of GATT/WTO members was to create the organization regulating and monitoring the multilateral trading system. WTO's "main function is to ensure that trade flows as smoothly, predictably and freely as possible." WTO also provides the litigation mechanism at the time of trade conflicts between the member states.

Trade policies reflect various motivations and goals of governments. Their implications can also be very different. The liberalization of trade policy and regulations improving market efficiency are in line with international regulations of the WTO. In contrast, some other policy measures can create unnecessary obstacles to trade, usually serving as a form of protectionism benefitting domestic industries. These protectionist measures and prohibitive obstacles are considered as violations of international trade agreements, causing trade disputes and conflicts. Studying the determining factors behind impositions of trade policies can help better understanding of the main motivations of governments. On the other hand, the analysis of consequences and effects of trade policies can demonstrate the significance of trade protectionism. Moreover, the analysis of various policy instruments can provide better insights for understanding true nature of protectionist policies.

* * *

In this dissertation, I am shedding light on some aspects of trade policy by studying both the causes and effects of them. I will follow the mainstream literature on international trade policy by focusing on some specific cases and trade policy instruments. In the beginning of XXI century, the level of tariffs is fairly low, and majority of them is bound by the WTO schedules of concessions, which leaves not much room for traditional trade policy. Most of tariff schedules are set in favor of developing economies, in order to provide a better access to international markets.

However, non-tariff measures (NTMs) with complex natures, motivations, and implications have become the most frequent trade policy instruments in the past two decades, which gives "legitimate motives" to governments to pursue their domestic interests. While governments provide various reasoning behind their policy instruments, they rarely reveal true motivations of their policies and our knowledge on the role of special interest groups in shaping their policy measures, is still limited.

In my dissertation, I will demonstrate the relationship between traditional tariffs and modern NTMs and calculate the tariff equivalents of non-tariff measures in both manufacturing and services industries. I also try to reveal the true nature of some NTMs, explain why some of them became an important trade policy instrument, and analyze their welfare implications. Moreover, I analyze the impact of some NTMs on the quality of imported products. Finally, I try to explain when the introduction of some NTMs (technical regulations) can lead to trade disputes among WTO members.

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1. In the first chapter of my dissertation, I analyze the aspect of traditional trade policy, by studying the determinants of customs duties, which are treated as the main conventional trade policy instrument. I focus on the role of the corruption in the "sale of protection" to the domestic industries. Corruption is a common phenomenon in developing countries that can affect the manipulation of customs tariffs. The range of bound tariffs by the WTO commitments in the developing countries is smaller in comparison to those of the developed countries. Thus, the impact of corruption on tariffs can be more pronounced in the developing countries. I investigate the impact of corruption on the level of trade protectionism, trade openness, and imports for the period 1996-2008. It is commonly argued in the literature that special interest groups, who are lobbying with governments for pursuing protection, can be more successful within a more corrupted society.

In the analysis, average customs and other import duties of a given country are treated as one of the protectionist measures and the average taxes on trade are considered as another proxy for trade restriction. Moreover, total trade-GDP ratio and total imports are also treated as proxies for the trade openness of a given country in this chapter. In addition, I included some specific imports subgroups to analyze how corruption can affect these various types of goods and services. The main independent variables are Control of Corruption from World Governance Indicator (WGI) and Corruption Perception Index from Transparency International website. Both proxies of corruption are analyzed separately. Unfortunately, despite application of appropriate econometrics techniques, in order for controlling problematic issues in the regressions, the results on the effects of corruption on protectionism and/or trade are statistically inconclusive.

On the other hand, the analysis presented in the first chapter demonstrates the importance of the WTO membership. The results of panel estimations reveal that the accession to the WTO decreases the level of taxes on trade and increases trade openness and total imports. However, GMM estimations, controlling for dynamic settings, do not show significant impact of WTO membership on trade. In fact, after becoming a WTO member, trade liberalization does not change the dynamics of trade significantly. The likely reason is that after the accession, countries are bound not to increase tariffs, meaning they cannot implement protectionist tariffs. However, they can use various non-tariff measures (NTMs).

The analysis of tariffs is relatively simple. The imposition of tariff is usually reducing the amount of products imports, by increasing the final price for consumers. By imposing tariffs, the governments can determine which domestic producers will benefit from higher prices of

imported goods. In fact, high tariffs can distort the free market system and consumers' behavior will be affected dramatically. On the other hand, the exporting producer can also change its strategy in response to import tariffs affecting the behavior of consumer and new market disturbances. The consequences of these issues can be evaluated relatively easily due to the transparent nature of tariffs. Consequently, the motivation and reasoning of the government manipulating tariffs can be clear. However, these statements cannot be repeated in the case of NTMs.

The analysis of NTMS is much more complicated. Non-tariff measures are specific policy instruments with opaque implications and unclear reasoning. Bilateral and multilateral agreements and international regulations within the WTO framework are set to liberalize international trade. The levels of tariffs have been dramatically reduced due to these regulations. However, technical challenges and new standards being set in order to reduce market imperfections and to increase consumers' welfare, and global safety and health, can have important trade implications. Governments – in accordance with international rules and regulations – can impose restrictions on imports for technical reasons. However, the imposition of NTMs needs to have justifiable and/or scientific reasoning. Otherwise, the NTMs are considered as unnecessary obstacles to trade and should be abolished as soon as trading partners are concerned. When trading partners cannot get to mutual agreement, they may refer to the dispute settlement mechanism (DSM) of the WTO. These potential reasons of conflicts have motivated the next two chapters of this dissertation.

2. In the second chapter of the thesis, a theoretical framework is established on "Welfare Analysis of a Prohibitive NTM in a Society with a Proportion of Concerned Consumers." The text is available among the working paper 'No. 12/2013 (97)' series of the Faculty of Economic Sciences of Warsaw University. Following the standard analysis of benefits of liberalization, the second chapter establishes a theoretical framework to study these benefits, when a prohibitive NTM halts the importation of a specific product that is believed to be harmful for a group of concerned consumers in a society. The ongoing negotiations on Transatlantic Trade and Investment Partnership (TTIP) and its public debates are showing the importance of consumers in defining the legitimacy of trade policies. Consumers are the main voters accepting or rejecting such trade agreements and being aware of their preferences and concerns.

The specific aim of this contribution is to provide a cost- benefit analysis in a partial equilibrium framework to investigate the welfare consequences of an NTM, such as a technical barrier restricting the importation of a potentially harmful product. The original contribution of this text is the analysis of two groups of indifferent and concerned consumers. The ultimate aim of the study is to investigate whether or not the paternalistic behavior of government is in line with the willingness of the consumers for demand. The existence of information about the origin of goods is the key issue of the analysis that provides two different scenarios. The model is then calibrated with data on consumption and importation of shrimps into the EU. The findings suggest that in the case of existence of such information, NTM leads to the lowest international losses and highest domestic gains. The conclusion of this analysis suggests that governments

should try to increase the information in the market, when they are acting in good faith when imposing this type of NTM.

The second chapter builds a theoretical framework for the analysis of the losses and benefits of a prohibitive trade instrument. The findings of the chapter can help governments, trade partners, and WTO Secretariat to provide guidelines on the imposition of these policy measures by other governments. However, due to very opaque nature of NTMs, it will be very difficult to figure out the true motivation of governments. Thus, in some cases they can lead to disputes and trade conflicts between trade partners. This aspect of trade policy is studied in chapter 4. The empirical analysis of trade implications of TBTs and other NTMs is presented in the subsequent chapter.

3. The third chapter of my dissertation, coauthored with Simona Jokubauskaite and Robert Stehrer, has been presented at the annual 2015 ETSG conference in Paris (10-12 September 2015). We focus the analysis on six types of NTMs: 1- Technical Barriers to Trade (TBT); 2- and Sanitary and Phytosanitary Measures (SPS); 3- Specific Trade Concerns (STCs) raised on TBT; 4- STCs raised on SPS; 5- Anti-dumping measures (ADP); and 6- other quantitative NTMS (QNTM) that allow countries to impose restrictions on the imports of low-quality products, being suspected to harm the domestic consumers' health or the ecological environment. Such trade policy instruments might induce higher standards in the import market, in addition to improving the market efficiency by information requirements such as mandatory labelling. In this chapter, I analyze whether the imposition of NTMs leads to quality improvement of the traded products. The analysis is based on a model matching both supply and demand sides of trade. The paper assesses the impact of different types of NTMs on the quality of the imported products. The analysis modifies and uses the existing information on the NTM notifications to the WTO from the Integrated Trade Intelligence Portal (I-TIP) during 1995-2011.

Using a rich database on NTM notifications of the WTO members, we studied the diverse impact of four types of NTMs on traded values, quantities, quality, and prices. ADP, TBT, TBT STC, SPS, SPS STC, and other quantitative NTMs (QNTMs) are the main variables of the analysis. Applying a demand-supply theoretical framework proposed by Feenstra and Romalis (2014) for the measurement of quality of traded goods, we distinguished the impact of NTMs on traded qualities and prices net of quality. In a gravity framework, we observed the diverse role of NTM in trade components.

The outcomes of the analysis points at quality improvement of traded products affected by the TBTs Moreover, TBTs are enhancing trade values, trade quantities, and prices, which might refer to a higher demand for standardized products. However, TBT STCs enhance trade flows while the results in the third chapter refer to low quality products on which TBT STCs are raised. While the general impact of TBTs on trade flows is positive, traded values and quantities are affected differently by each product category, which gives insights on the diverse characteristics of products and their final use.

In contrast to these results, SPS imposition influences the product quality in the opposite way. Our results suggest that SPS have restricting impact on quality of products and trade. Thus,

these trade policy instruments can – surprisingly – induce lower quality of products. The similar trends are observed in the case of quantitative NTMs, which also significantly downgrade the quality of traded products.

Finally, the analysis shows that Anti-dumping measures (ADP) enhance trade values and quantities. The ADP is imposed to restrict the low pricing of the imported product under dumping. When the exporter is obliged to export with higher price after the imposition of ADP, reducing the quality of the exported product can be a good strategy to excuse the low dumping price. This strategy increases the demand and finally the import values of the product under the ADP, which makes the ADP a trade enhancing policy instrument rather than a restrictive one.

4. In the fourth chapter of this dissertation, co-authored with Jan Michalek, and edited as a working paper 'No. 22/2014 (139)' series of the Faculty of Economic Sciences in Warsaw University, we study the likelihood of future trade conflicts. Even if in some cases, a policy instrument such as TBT does not explicitly limit international trade it can distort it or affect total international trade, which might involve many trade partners in the world. This situation can lead to potential conflicts and levy costs to producers and consumers.

Economic science not only tries to find out the most efficient way to produce, but also needs to establish frameworks in which positive externalities of production are encouraged and negative externalities are gradually reduced or eliminated. These frameworks can be established within new standards and regulations, which can be imposed via technical barriers to trade. A restrictive trade policy measure that hampers trade liberalization or distorts trade flows can be consulted and analyzed within the Dispute Settlement Mechanism (DSM) of the WTO. The Agreements on NTMs have been cited in many trade disputes within the DSM. If, after consultations, a verdict of the DSM panel indicates that the analyzed measure violates a specific WTO agreement, then it is understood that it creates an unnecessary restriction to trade. These consultations and DSM proceedings identify most important restrictions on trade among WTO members. To be precise, the analysis is devoted to trade conflicts and disputes within WTO, with special focus on cases in which TBT Agreement has been cited.

The analysis in this chapter of this dissertation is aimed at verifying to what extent and in which circumstances the TBT notifications can serve as a system of early warning for future disputes in the areas of TBTs. During 1995-2011, there have been 45 requests for consultations for the DSB of the WTO in order to identify the violations in TBT agreement. The possible explanations and violations of TBT Agreement analyzed by the DS bodies are discussed in this chapter.

The WTO provided a TBT dataset covering Specific Trade Concerns (STC) raised by its members. In this chapter, we look for the linkages between DS cases citing TBT agreement and the TBT STC notifications. In an econometric analysis, using data for bilateral trade of products at two-digit level of Harmonized System (HS), a positive relationship between raising TBT STCs and DS cases on TBT is found. In other words, it is acknowledged that a rise in the number of STC on TBT would increase the probability of trade conflicts on TBT. Thus, some new TBT regulations, in principle aimed at protection of consumers, hamper trade flows, causing disputes and conflicts within the WTO. In order to decrease the number of these

conflicts, a new set of regulations should be set to increase the transparency of NTMs. The new rules should allow only legitimate NTMs to be imposed with clear reasoning far from trade protectionism, and genuinely requested to pursue "good faith" objectives, such as protection of consumers' health.

The benefits of trade liberalization and implications of trade restrictions are the main issues discussed in this dissertation. Promotion of technological progress, improvement in resource allocation and economic growth are facilitated by globalization. Globalization, like regionalization, creates some benefits and costs. For example, the advantages of pooling labor and information sharing due to regionalization are also associated with the costs of congestion (Shujiro, 2004). Since the late twentieth century, the world economy has experienced a considerable intensification of economic and financial integration. Gradual trade, capital and services liberalization, progress in telecommunication and rapid technological improvement in transport, have increased the demand and supply for international flow of services and goods.

The process of globalization is the strengthening financial and economic links within and between geographic regions. Multilateral trade liberalization under the GATT has accelerated the speed of postwar globalization. Deregulation and privatization of state-owned enterprises, unilateral liberalization of trade and investment, and the lower cost of foreign transactions resulting from technological progress in telecommunications and transportation, deepened the process of globalization. Creation of the WTO and establishment of GATS (General Agreement on Trade in Services) in 1994 were the first steps towards worldwide liberalization of trade in services. In addition to WTO agreements facilitating trade liberalization, creation of free trade areas and customs unions, have increased the regional liberalization of trade more than before. The European Union is the best and biggest example of regionalization covering free trade of goods and services, and free mobility of factors of production. In the next chapter of this dissertation, I study the scope of services' liberalization and trade frictions within the EU.

5. The fifth chapter of this dissertation, co-authored with Jan Hagemejer and Aneta Mach, is entitled "Services trade liberalization in the transport sector." This text has been published as the chapter in the book entitled: Liberalization of Transportation Services in the EU: the Polish Perspective, published in 2015 by Peter Lang GmbH.

The restrictive effect of trade policy measures studied in the earlier chapters of this dissertation is measurable in terms of simple tariffs or possible tariff equivalents, since these instruments are applied to trade in goods. However, there are no tariffs imposed on services' trade; but there are many other institutional or informal measures restricting the access to local markets. Thus, it is relatively difficult to measure the level of protectionism observed in the case of trade in services.

Services are playing an important role in economies, either as a final consumption product or more importantly as an intermediate in the production of goods. Despite its crucial role, international trade in services is still small. In other words, services share in advanced economies is around 70% of the GDP, while services trade in total trade amounts to around 35% in these economies. Low trade in services can result from trade frictions and barriers to trade. Despite existing obstacles and barriers in services trade, it is not possible to conduct

similar analyzes as in previous chapters to investigate the role of protectionism in services. Hence, there is a necessity to apply other approaches such as quantification of trade restrictions using econometric techniques. In the fifth chapter of this dissertation, we try to quantify protectionism in services, expressed in terms of tariff equivalents. The focus of the analysis will be aimed at rail transportation services, as it is an old mean of transportation of goods, which as an important intermediate essentially facilitates international trade in goods.

The aim of the fifth chapter is to assess the degree of the trade liberalization and its impact on bilateral trade in rail transportation services. In spite of the endeavors of EU directives and regulations to provide free liberalized trade of goods and services between member states, trade barriers in services are still observed. A gravity equation using bilateral trade data was estimated similar to those used in the analysis of merchandise trade to assess the role of the EU regulatory frameworks on the services trade flows across EU members. Liberalization indexes provided by IBM Consulting Services (IBM, 2007 and 2011) were treated as proxies of facilitation of services' trade. The estimated gravity model is used to compute time varying tariff equivalents. In the absence of duties or tariffs imposed on services trade, computation of tariff equivalents proposed in the study can shed light on the level of trade liberalization. The quantification of trade effects resulting from existing NTMs applied to the rail services is another major outcome of the last chapter of my dissertation.

6. The last chapter of this dissertation, co-authored with Julia Grübler and Robert Stehrer, is entitled "The Bilateral Impact of NTMs in Global Value Chains." This paper has been presented at the annual 2015 ETSG conference in Paris (10-12 September 2015).

In the fifth chapter, tariff equivalents of trade barriers in rail transportation services were calculated. As mentioned earlier, no tariffs are levied on services trade, while trade in goods is controlled by both tariffs and non-tariff measures. Tariffs are mostly ad-valorem taxes levied on imports of goods. Moreover, non-ad-valorem tariffs can be easily transformed into the ad-valorem taxes using import prices and quantities (UNCTAD/WTO, 2012). However, NTMs and their implications are not easily quantifiable. In order to quantify the effects of NTMs on trade flows of each product, we can estimate the ad-valorem equivalents (AVEs) of NTMs using a gravity framework. Then, using the import demand elasticities, we calculate the impact of an NTM on the price of the imported product, which is equivalent to ad-valorem tariffs.

In this chapter, we examine the impact of non-tariff measures (NTMs) on trade between countries at the 6-digit level of the Harmonized System (HS) over the period 2002-2011. We draw on existing information on NTM notifications to the WTO from the Integrated Trade Intelligence Portal (I-TIP) distinguishing various types of NTMs. Following existing literature (e.g. Kee et al., 2009) a gravity approach is chosen to assess whether NTMs facilitate or impede trade across countries.

Previous estimations of AVE of NTMs (Kee et al., 2009; Bratt, 2014; and Beghin et al., 2014) were calculated on a cross sectional data – and only for average 2001 to 2003 – due to lack of information on NTMs. In our study, we use a rich database on NTM obtained from WTO I-TIP and improved methodology by Ghodsi, Reiter, and Stehrer (2015) we extend their contributions to a panel analysis, which provides estimators that are more efficient. Previous calculations

were not distinguishing NTM types whose diverse attributes by motives would bring various trade consequences. In this chapter, we differentiate NTMs within four major categories ADP, TBT, SPS, and QNTM, which provide insights on the implications of different types of NTMs. In addition, in previous studies, intensity of NTMs was not considered and existence of NTMs was mainly analyzed as a dummy variable. In our analysis, we show the intensity of NTM types by counting the number of NTMs in force from the beginning of the period of analysis. Another contribution is the new estimation methodology that increases the efficiency and the number of non-zero AVE outcomes by using the importer factor NTMs in pooled estimations over all countries, rather than by single importer-product estimations. Hence, the prominent contribution of this study relies on the variation of NTM effects by importer countries. In previous studies, the empirical approach gave an average impact of NTM on the import of products to all importers. The variation in the calculated AVEs thus, depended mainly on the variations in the import demand elasticities, which by construction depended only on variation of product imports share to GDP across all importers. However, the novelty of this contribution is highlighted by both variations of import demand elasticities across importers and variations of NTM effects using the interaction approach.

Earlier chapters of this dissertation pointed to possible positive externalities and a trade-enhancing effect of some NTMs. Complexity of NTMs is due to their various causes and diverse impacts. By calculating AVE for NTMs in this chapter, we distinguish the trade enhancing NTMs that might be imposed in good faith from the prohibitive NTMs that might be caused by protectionist motives of the governments. While Kee et al. (2009) assumed that NTMs were only impeding trade, our results identify whether each NTM imposed by a WTO member had a positive or a negative impact on trade. Controlling for the sample selection bias, we run 5224 regressions using Heckman procedure and FE Estimator with a robust variance-covariance matrix, clustering for country-pairs. Estimations by product at 6-digit level of the HS results in AVEs for four types of NTMs imposed by 149 WTO members (that gives around 780,000 AVE for each type of NTM). Somewhat surprisingly, in the case of about 52% of cases, the tariff equivalents display a negative sign.

Summing up, my dissertation is focused on various aspects of contemporary protectionism. In fact, it is providing a laboratory for analyzing international trade policy and various trade instruments. Firstly, I studied the determinants of tariff policies in a number of countries, with a special focus on the role of corruption. Next, I analyzed – in a theoretical framework – the rationale for NTMs in a society of developed country, with a large share of concerned consumers. I concluded that the introduction of prohibitive NTMs requires a high level of transparency in implementing trade policies. Afterwards I analyzed empirically the implications of TBTs and other NTTMs on trade flows. In particular, I studied the implications of NTMs for prices and quality of traded goods. The introduction of non-tariff measures can restrict international trade and lead to trade conflicts. In the fourth chapter, I demonstrated that notifications of specific trade concerns on the TBT and SPS measures could be treated as a predictor of future trade disputes among WTO member states. In the fifth chapter, I analyzed empirically the tariff equivalents of barriers existing in rail transportation services. I also estimated the possible impact of trade liberalization of this sector of services. Finally, in the last

chapter, I quantified the tariff-equivalents for six types of NTMs imposed on all 6-digit products of the HS rev.2 by all WTO members. The generated database for the importer-specific AVE for NTMs is the rich outcome identifying the trade implications of the different types of these policy instruments worldwide. Our results help to identify whether each NTM imposed by a WTO member had a positive or a negative impact on trade flows. I believe that my dissertation sheds light on some aspect of contemporary protectionism in the societies with a high proportion of concerned consumers such as the European Union, in which governments apply various forms of non-tariff measures.

1. Corruption and the Level of Trade Protectionism

Abstract: In this chapter, impacts of corruption on the level of trade protectionism, trade openness, and imports are analyzed. It is argued that special interest groups who are lobbying with corrupted governments might seek more benefits in some special subgroups of imports. Possible country and time specific fixed effects, endogeneity and some other problems in the regressions are controlled to achieve results that are more robust. Corruption measures from two different sources of Worldwide Governance Indicator and Transparency International website are analyzed in two separate similar approaches. It is finally concluded that both measures of corruption implicate negative influence on only one import subgroup, while there is no significant impact on protectionism measures.

1.1. Introduction

Impact of corruption on different aspects of economics has been studied widely in the literature. Corruption is one of the institutional qualities that have a negative effect on economic measures like growth and trade. Policy makers in corrupted governments and societies do not maximize total national welfare of the economy. In fact, they are selling their beneficial power to enhance the opportunities for special interest groups who are lobbying, in order to stay longer in power.

In this study, I am using corruption as a measure of authorities' misuse of power for special interest groups, which leads to the government's policies alterations and can affect trade patterns of a country. The main hypothesis of this study is that higher level of corruption causes higher levels of trade protection. Similar studies have been done previously over other samples of data. Bandyopadhyay and Roy (2007) analyzed this effect for 88 countries over the period 1982-97. In this analysis, I have relatively a similar analysis over a newer period. There are some differences between this study and previous studies. Firstly, I am analyzing various models whose dependent variables are different from each other. Secondly, I want to figure out that which trade subgroup is mostly affected by corruption. In other words, I will check impacts of corruption on some Import subgroups and conclude that some of them are more affected by corruption, which shows higher benefits of those types of imports for the special interest groups who are lobbying with corrupted governments. I will also address heterogeneity and endogeneity problems of regression and will provide a suitable approach in order to control them.

The rest of the chapter is organized as follows: section 2 presents the literature review. In section 3, hypotheses of the study and the expected impacts of variables are elaborated. I specify the estimation in section 4. In section 5, data specifications are presented. Section 6 represents the results of the estimations and finally in section 7 some conclusions are elaborated.

1.2. Literature Review

Role of corruption on bad economic conditions have been studied widely in the literature. Dietz et al (2007) continued a typical issue about the effects of institutional qualities on positive genuine saving (GS), which is a necessary condition for sustainable development. In fact, according to the definitions, GS is a net saving rate in a national accounting framework encompassing resources depletion and environmental degradation. In their analysis, they found that low corruption has a positive impact on genuine saving in interaction with resource abundance of countries. Corruption is an important factor in the alteration of both political and economic decision-makings. While this institutional quality is not affecting the growth of economic directly, high levels of corruption lead to some biased and wrong decisions of officials in the governments that are not maximizing national welfare of the society and finally because of creating some disorders in the economy they lead to lower growth.

Grossman and Helpman (1994) constructed a model that shows that special interest groups are seeking for government's choice of trade policy by making political contributions. Politicians are maximizing their welfare that is strongly affected by the contributions they have received. Therefore, policies are influenced by the different lobbies that construct a protection for the government's voters and those special interest groups. In this manner, the fundamental role of the government that is taking care of its own society will be bounded to some special limited groups of people.

Some researchers studied the effect of corruption on different aspects of economy and found endogeneity of corruption in their models. Brunnschweiler and Bulte (2007) proved that resource abundance has a positive impact on growth and a negative impact on institutional qualities, which means resource abundance countries, can have higher rates of corruption. Besides high level of institutional quality has a positive impact on growth which both lead to endogeneity of corruption and other institutional qualities. In order to solve the endogeneity problem they used 3SLS estimation method.

Dutt and Traca (2010) claimed that corruption could have two different effects on trade relating the level of protectionism. If the level of protectionism, taxes, and duties on trade are not so high, corruption leads to extortion. This means that corrupt customs officials extort bribes from exporters and importers, which causes lower level of trade (the extortion effect). Nevertheless, if we are confronting a very high tariff environment the corrupt officials allow exporters and importers to avoid tariff barriers (the evasion effect). These findings suggested that in the empirical analysis of corruption and trade, causality of the variables should be carefully considered, as it might cause endogeneity of corruption in the regression. Gatti (2004) studied whether barriers on international trade and capital flows are directly related to the higher level of corruption. He found evidences that collusive behaviors between individuals and customs officials are the main reasons of corruption and incentives of corruption are not mainly those of trade restrictions.

Treisman (2000) analyzed several measures of perceived corruption and found out some more developed countries with protestant traditions, histories of British rules, and higher imports were less corrupted. His findings have been useful for other scholars like Bandyopadhyay and

Roy (2007) to find good instruments of corruption in their empirical analyzes. They studied the effects of corruption on trade. They analyzed impact of corruption on three different measures of import duty, trade tax, and total trade-GDP ratio in a simple gravity model. Their analysis was over 88 countries in a panel data over the period 1982-1997. They controlled for unobserved heterogeneity among countries with application of Fixed Effect estimator. In addition, they used instrumental variable regression to control for the endogenous characteristics of corruption in their analysis. Eventually, they proved that corruption has a significant positive impact on the protectionism and trade barriers and has significant negative influence on the trade openness.

Thede and Gustafson (2012) in a working paper studied multifaceted corruption impact on trade on a cross section estimation for 1999. Five different characteristics of corruption that they analyzed were level, prevalence, customs location, function, and predictability of corruption. In corruption-augmented gravity equation, which was estimated by Heckman version of a GMM instrumental variable method, they found evidences that these characteristics of corruption have significant negative influence on bilateral trade.

1.3. General Hypotheses of the study

I am analyzing the impact of corruption on different dependent variables. Firstly, I investigate this effect on two models with protectionism measures as dependent variable. "Customs and other import duties" holds one of the protectionism measures, and "taxes on international trade" is the other one. According to the World Development Indicators definitions, the first one defines as "customs and other import duties are all levies collected on goods that are entering the country or services delivered by nonresidents to residents. They include levies imposed for revenue or protection purposes and determined on a specific or ad valorem basis as long as they are restricted to imported goods or services.[1]" While the latter describes as, "Taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes.[2]" Secondly, I analyze the impact of corruption on trade openness measures, which are "total trade GDP ratio", "total imports", "goods imports", and "services imports" on four different models. Finally, I estimate some models whose dependent variables are different types of import subgroups to check which types of import are highly affected by corruption. This shows the beneficial aspects of those types of imports for special interest groups who are lobbying with corrupted government. Note that the selection of these import subgroups is mainly based on the availability of data. Six subgroups of imports are as follows: "computer and communications services", "food", "fuel", "information and communication technology goods (ICT)", "manufactures", and "ores and metals".

According to the existing literature, corruption is expected to increase the level of trade protectionism, and decrease the level of imports and in general trade openness. However, since higher corruption of a country is represented by a lower value of corruption in the data, negative

[1] http://data.worldbank.org/indicator/GC.TAX.IMPT.CN
[2] http://data.worldbank.org/indicator/GC.TAX.INTT.CN

sign of coefficients are expected for trade protectionism models, and positive signs for trade openness and imports.

I am using some factors that were used previously in different studies as control variables. Real GDP per capita, real GDP, government expenditure, current account balance, and WTO membership are the control variables, which have different impacts on the dependent variable.

Countries with higher real GDP per capita that are more developed, can afford policies that are more liberal. In other words, developing countries with lower GDP per capita may impose higher level of tariffs and duties in order to protect domestic market and industries. GDP is a proxy for country size that can show the measure of market size in a country. Hence, a country with bigger GDP is willing to trade more. However, there can be another hypothesis that bigger countries avoid openness of trade since they can supply their own domestic markets. Nevertheless, these two opposite hypotheses can be tested in the regressions.

It was stated in the literature that government expenditure has a positive relation with international trade, Rodrik (1996). He explained that, when terms-of-trade risk is very high, government spending reduces the risk of exposure to international trade by inclusion of some effective controls. Therefore, according to his analysis, there is a positive correlation between openness and the government size. Meanwhile, we can declare that countries with bigger governments might be less liberal, and consequently have higher imposition of trade barriers. However, we can conclude the exact impact after obtaining the results of regressions.

Table 1.1 - Expected signs of coefficients according to hypotheses

Variable	Duties on import	Taxes on Trade	Trade-GDP Ratio	Other imports
Corruption	Negative	Negative	Positive	Positive
Real GDP	Unknown	Unknown	Unknown	Unknown
Government Expenditure	Unknown	Unknown	Unknown	Unknown
Current Account Balance	Unknown	Unknown	Unknown	Unknown
GDP per Capita	Negative	Negative	Positive	Positive
WTO Membership	Negative	Negative	Positive	Positive

Note: Corruption is expected to increase trade protectionism and decrease level of trade. However, signs of corruption coefficients in models are expected as in the table, because the corruption indices show higher corruption with lower values. Next section describes the corruption indices.

Governments with higher current account deficits seem to impose higher trade tariffs and taxations on imports in order to generate revenues. However, they might impose export taxes when they encounter surplus. Therefore, current account balances seem to have negative impact on import protectionism and positive impact on imports, while the impact on total trade and taxes over that is unknown. On the other hand, current account balances are mainly the results of imports and exports. When the imports are increasing, current account balances decrease. This reverse causality will make us to conclude after estimations.

Members of World Trade Organization (WTO) have regulatory limitations in imposition of protection on imports. Hence, countries that became members of WTO may impose high tariffs and taxes on trade less frequently. Giving these hypotheses, I expect coefficient results for variables that are indicated in Table 1.1.

1.4. Estimation specification

Since this study is based on a panel data, OLS regression seems to be inconsistent as we might have country specifics and time fixed effects (FE). I control for fixed effects of time and country specifics in the regressions using fixed effect estimators. However, in this study, I apply Haussmann test to check for significance of random effects (RE) in each equation; thus, some equations are estimated via random effect estimator instead of fixed effects. A general model can be constructed as follows:

$$Y_{it} = \beta_0 + \beta_1 corruption_{it} + X'_{it}\beta_2 + \gamma_t + \varphi_i + e_{it} \qquad (1.1)$$

Y_{it} is the dependent variable for country i at time t, which will be different in the models of estimation. In fact, I estimate 12 equations whose dependent variables are different. β_0 is the constant term, X_{it} is a vector of control variables, γ_t indicates time specific effects and φ_i indicates country specific effects, and e_{it} is a vector of error terms.

In the simplest model, equation (1.1) is estimated using FE and RE estimators that can control for time and country specific effects. In order to control for the existing heteroskedasticity in the regressions, robust estimators are used.

As it was mentioned earlier, different studies observed endogeneity of corruption in trade and economic models (Treisman 2000, Bandyopadhyay and Roy 2007, and Brunnschweiler and Bulte 2007). When there is an improvement of institutional qualities, there must be less bureaucracy in countries, which will increase the level of trade and will decrease the level of corruption. Moreover, other explanatory variables in the model can also have endogeneity and reverse causalities with the dependent variables. Current account balance is highly affected by the trade flows, which seem to be result rather than cause of the dependent variables. Besides, even though high government expenditures can stabilize the risk of trade by implementation of various trade controls, they can be highly affected by the revenues gained on trade.

To reduce the endogeneity bias in the estimations one can use instrumental variables. According to Hausman tests, using FE and RE estimator with instruments for corruption was not consistent

in comparison with FE and RE estimators without any instruments. Moreover, for complete control over the model various instruments are needed for each independent variable. Thus, I use system GMM to achieve the most consistent unbiased outcomes. Augmented version of difference GMM proposed by Arellano and Bover (1995), which is an improved version of GMM proposed by Arellano and Bond (1991). This augmented version was developed by Blundell and Bond (1998) and it is a system GMM that has a two-step standard error correction mechanism. This estimator provided by Roodman (2006) in Stata is suitable for panel datasets with short periods and many groups that contain fixed effects and heteroskedastic idiosyncratic errors, which are similar to the data in this study. Lags of levels and lags of differences of variables are used in differenced and level versions of the system GMM such that the outcome is highly consistent and unbiased. The estimations are compatible with tests of the estimation as shown in the Table 1.3 and Table 1.5.

In addition to the lags and differences of variables, some instruments are included in the GMM estimation. OECD countries that are more developed have some anti-corruption legislation; therefore, they seem to be less corrupted. It was mentioned in the literature that countries with British colonial heritage are less corrupted. However, I add colonial heritage of some other developed countries that have significant correlation with corruption. It means that the countries with colonial past are less corrupted. Colonies of the United States of America, United Kingdom, France, German, Belgium, Portugal, Spain, and the Netherlands are included in one variable as an instrument. In the literature, countries with protestant regulations are proved to be less corrupted. However, there were no official data for this variable. Year dummies are also included in the instrument covariates to decrease the heterogeneity problem in the data.

1.5. Data Specification

This analysis is over an unbalanced panel data consisting of around 200 countries between the period of 1996 and 2011. The main independent variable in this study is from two different sources. One is Control of Corruption (CC) from Worldwide Governance Indicator (WGI) published by the World Bank website[3], which exactly defines as "perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.[4]" In this dataset, lower scores of index, which can be also negative, shows the higher level of corruption. For example, in 2011, Somalia had the highest corruption with the score of -1.72 and Denmark had the lowest level of corruption with the score of 2.42. This indicator includes indexes of 212 countries in the period between 1996 and 2011 but it does not have any data for any country in 1997, 1999, and 2001.

The second source of data for corruption is Corruption Perceptions Index (CPI) of Transparency International website[5], which provides similar data to the previous one but includes the indexes

[3] This data is available at: http://info.worldbank.org/governance/wgi/index.asp
[4] http://info.worldbank.org/governance/wgi/faq.htm
[5] This data is available at: http://transparency.org/policy_research/surveys_indices/cpi

for about 182 countries in the period between 1998 and 2011. This index like previous one is compiled from different surveys carried out by various organizations, but it is only positive. Similarly, the score with lower value shows higher level of corruption. For example, in 2011, Somalia and North Korea had the highest corruption with the score of "1" and New Zealand had the lowest level of corruption with the score of 9.5. There is a significant positive correlation between variables of both sources.

The WTO variable is a dummy variable that gets value of "1" if at the time "t" the country is a member of WTO and gets value of "0" if at that time the country is not a member. This data was taken from the WTO website[6]. For corruption instruments, OECD is a dummy variable that gets value of "1" if the country is part of OECD and gets value of "0" if it is not[7]. Colonies variable is constructed in a way that receives value of "1, 0.75, 0.5, and 0" if respectively the country is currently a colony, was a colony after 1945, had been a colony before 1945, and has never been a colony of above mentioned countries. Giving a unique value to all colonies makes them exactly similar to each other; while some countries with a long history of independency like Egypt do not have anything in common with Britain right now. Data on colonial heritage was compiled from the CEPII database[8] and was completed for those missing in CEPII data by own research.

The data for all other variables in the model are taken from the World Development Indicators (WDI) of the World Bank[9]. Dependent variables, current account balance, and general government final consumption expenditure variables are all described as percentages to GDP. If the raw data was not in terms of percentages of GDP, own calculations were done considering current and constant prices, local currency, and US Dollar units of both variables and GDP. Total GDP and GDP per capita that were in US Dollar units are logged in the estimations. Dummy variables and corruption indices are in the regressions as explained above without any changes.

1.6. Results

Two categories are estimated, one with the CPI and the other with CC from WGI. In each of them, I estimate 12 equations in two parts using two different estimation methods as explained before.

1.6.1. CPI category

1.6.1.a. Regression using FE and RE estimators

Table 1.2 shows the estimation results of the CPI category using FE and RE estimators. Hausman test for consistency of FE suggests that the first column should be estimated using

[6] This data is available at: http://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm
[7] This data is available at:
http://www.oecd.org/general/listofoecdmembercountries-ratificationoftheconventionontheoecd.htm
[8] This data is available at: http://www.cepii.com/anglaisgraph/bdd/distances.htm
[9] This data is available at: http://data.worldbank.org/data-catalog/world-development-indicators

RE and the rest of the equations should be estimated using FE estimators. R-squared and Adjusted R-squared are very close to each other in all equations. However, they are very small that show the explanatory power of the independent variables.

Between two trade protectionism measures, only the second one shows a statistically significant negative coefficient for CPI. Corruption increases tax on trade as expected. CPI also gets expected significant positive signs for three of the openness measures. Corruption decreases trade GDP ratio, total imports, and goods imports. Among import subgroups, corruption decreases ICT goods and manufacture imports. These results conclude that CPI has a statistically significant impact on the imports of goods. Thus, tax on trade, total imports, and trade GDP ratio are mainly affected by corruption through imports of goods. It is observed that services imports and services import subgroups are not affected by corruption. Special interest groups are mainly interested in the import of goods and they put their efforts with the corrupted government to achieve their goals via these imports.

GDP per capita coefficient is statistically significant only in two of the models. It shows positive impact on both taxes on trade and ICT goods imports. Developed countries with higher GDP per capita seem to impose more taxes on trade, while they import higher levels of ICT goods. Government expenditure statistically significantly increases customs and import duties and decreases trade GDP ratio, ICT goods imports, and manufacturing goods imports. This is in opposition with one of the hypotheses that were mentioned earlier about this variable. However, if we think of the reverse causality of government expenditure and the dependent variables, these results seem to be appropriate. Thus, countries with bigger governments are less liberal in trade.

GDP coefficient is statistically significant for four models. GDP decreases trade protectionism measures, and increases total imports and fuel imports. It means that countries with bigger market and higher capacities put less restriction for trade. Big markets need big supply side or even more differentiated products from many suppliers. Moreover, bigger countries impose less tax on total trade, which can be also on exports. This can suggest that big domestic industries of such countries will be flown to foreign markets easily.

Current account balance shows statistically significant coefficients in seven equations. The results for this variable show again the reverse causality with the dependent variables. In other words, imports decrease current account balances effectively, while it can be incorrectly perceived in the table of estimations that this variable has a negative impact on imports. WTO coefficients show that being a member of WTO would decrease taxes on trade and would increase trade GDP ratio and total imports for the members significantly, which seems in line with the hypotheses.

1.6.1.b. GMM regression

Table 1.3 shows the estimation results of the system GMM over the data sample of CPI and also the post estimation tests for autocorrelation in differences, and Hansen over-identification tests for the instruments. According to these test statistics, best combinations of lags and lags of differences of variables were used for all models. Two lags of the dependent variable, all

explanatory variables in levels, year dummies, and first lags of the explanatory variables except the WTO variable were included in each equation. As it was mentioned earlier, some instruments were also used as standard instruments of the regressions. Given Arellano-Bond Autoregressive tests approve the usage of differences and lag of differences for all models. Instruments for total trade model are not exogenous in both GMM and IV equations according to the Difference-in-Hansen tests. In addition to that, these tests show similar issues for the GMM differences equations, and IV excluding groups in services import model. Other possibilities were checked for those models, but these combinations of variables are the most suitable ones. All other models have suitable test statistics of the post estimation.

As observed in Table 1.3, current value of CPI has statistically significant coefficient in only food import model. This shows that corruption decreases only the current level of food imports that seem to be very attracted by special interest groups lobbying with corrupted government. However, lag of this variable in this equation is negative, which might suggest that previous level of corruption in a country might even increase the level of current food import. This result might be interpreted that special interest groups, especially in poor countries with a high level of corruption, try to change the pattern of trade in food according to their interests. Food import decreases and then when they find a good chance to import, the food import in the next year (long run) will be increased through their channels. This can be a single interpretation while other dependent variables such as trade protectionisms are unaffected.

There are two other statistically significant coefficients for the lag of corruption in tax on trade and services imports models, which are both positive. These two outcomes respectively can be interpreted as the negative impact of past corruption on the current level of tax on trade and services imports. However, the p values of both coefficients are very close to 10% level of significance, which might be negligible.

Log of GDP per capita has statistically significant positive coefficients for the two trade protectionism models and six of other models. Thus, it means that more developed countries not only impose higher protectionism measures against trade, but also have more trade openness and imports. Lag of log of GDP per capita has very close coefficients to the current log of GDP per capita in all models, but with negative signs. Since this variable is in logs, the coefficients show the impact on the dependent variables marginally. Because of linear relation between them, the marginal effects are similar all the times but with reverse impacts, which prevents divergence of the model in the long run.

Similar situation to the previous variable is observed for the log of GDP in all models. Nevertheless, this variable does not have any significant impact on trade protectionism models, and it has negative statistically significant impact on seven other models. Current values of GDP decrease trade openness and some imports, while the past values of it have the reverse impact with the same magnitudes.

Current value of government expenditure has statistically significant positive impact on only customs and import duties. Similar to results of Table 1.2, this result also shows that countries with bigger government expenditures are less liberal and they impose protectionism on trade to reduce the trade openness and imports.

Current account balance variable has significant negative impacts on all trade openness and imports, except computer services imports. This result is similar to the outcomes of Table 1.2 Even though usage of first differences and instruments decrease the dual causalities of variables; it is observed that current account balances decrease level of trade and imports. A country with higher current account balances has excessive exports in the current period. It brings a situation that in the next year imports increase and the account balances decrease in the next period, as the lag of this variable has positive statistically significant coefficients.

WTO members seem to have less import of services, food, and computer services with respect to non-members according to the results of Table 1.3, which is against the hypotheses.

1.6.2. CC Category

1.6.2.a. Regression using FE and RE estimators

Table 1.4 shows the estimation results of the CC category without application of instruments. Hausman test proves that all equations should be estimated using FE estimators due to consistency and efficiency of the regressions. Robust estimators were estimated due to the existence of heteroskedasticity in error terms. R-squared and Adjusted R-squared have similar situations to previous category. Corruption perceived as CC in this table decreases import of services and computer services significantly. The coefficient of this variable is not statistically significant for any other models.

Control variables have almost similar results and interpretations to the previous category estimated by FE and RE estimators. Statistically significant coefficients for log of GDP per capita show that more developed countries impose higher trade protectionism measures with respect to less developed countries. Besides, this variable increases computer services imports and decreases fuel imports significantly. Government expenditure increases the customs and import duties and food imports, and decreases the import of ICT goods. In addition to similar results of log of GDP in this category with results of the CPI category, this variable increases trade GDP ratio and imports of goods, while it decreases the level of computer services imports. Coefficients of current account balances and WTO in this category are almost similar to the results of CPI category and they have the same interpretations.

1.6.2.b. GMM regression

Specifications of the GMM regression of this category are chosen similarly to the category of CPI. Table 1.5 represents the outcomes of the GMM regressions of CC category and their post estimation tests. The latter suggests that the specifications and inclusion of instruments and lags for all models in the former table are appropriate. Except in the last column of Table 1.5, all coefficients of corruption are statistically insignificant. This result states that corruption perceived by the WGI surveys increases the current level of metal imports, and decreases the next levels of this import subgroup. In other words, special interest groups are attracted to the import of metal and they pursue high level of metal imports for the current period. When they undertake imports through their own channels, in the next period the import of this product is decreased.

Table 1.2 – FE and RE estimation of CPI

	Customs and Import Duties	Tax on Trade	Trade-GDP ratio	Total Im.	Goods Im.	Services Im.	Computer Ser. Im.	Food Im.	Fuel Im.	ICT Goods Im.	Manufacture Im.	Metal Im.
CPI	-0.00085	-0.0037***	2.25*	0.013*	0.014**	-0.0050	-0.12	0.069	0.11	0.44*	1.36**	0.058
	(0.00082)	(0.0013)	(1.32)	(0.0066)	(0.0058)	(0.0059)	(0.22)	(0.10)	(0.29)	(0.25)	(0.66)	(0.053)
log of GDP per Cap.	-0.0021	0.053***	-2.58	-0.034	0.027	0.031	13.8	-0.99	-4.70	7.11*	7.75	0.36
	(0.0022)	(0.017)	(15.2)	(0.082)	(0.080)	(0.052)	(8.82)	(1.58)	(5.07)	(4.07)	(7.46)	(0.88)
Gov. Exp.	0.00081***	0.00038	-0.80**	-0.0019	-0.0013	0.00089	0.28	0.033	-0.072	-0.12**	-0.33**	-0.014
	(0.00031)	(0.00027)	(0.36)	(0.0016)	(0.0021)	(0.0012)	(0.20)	(0.029)	(0.073)	(0.053)	(0.16)	(0.013)
log of GDP	-0.0063***	-0.049***	20.0	0.11*	0.076	-0.038	-9.82	1.25	9.67**	-5.50	-0.025	0.70
	(0.0018)	(0.012)	(12.4)	(0.063)	(0.067)	(0.051)	(8.57)	(1.16)	(4.25)	(3.51)	(5.81)	(0.65)
Cur. Acc.	0.000084	0.000049	0.020	-0.0037***	-0.0043***	-0.0009***	0.018	-0.035***	-0.058*	-0.029**	-0.27***	-0.0033
	(0.000096)	(0.00011)	(0.14)	(0.00095)	(0.00066)	(0.00034)	(0.12)	(0.0079)	(0.033)	(0.014)	(0.050)	(0.0086)
WTO mem.	-0.0023	-0.0075***	9.89*	0.067**	0.045	0.0098	-0.97	0.33	-0.54	0.22	3.10	0.23
	(0.0030)	(0.0021)	(5.22)	(0.028)	(0.027)	(0.0092)	(0.62)	(0.52)	(0.89)	(0.66)	(2.02)	(0.21)
Constant	0.18***	0.79***	-380.7*	-1.93*	-1.79	0.77	128.9	-19.5	-191.6***	79.9	-40.4	-19.3**
	(0.038)	(0.17)	(199.1)	(0.99)	(1.08)	(0.85)	(141.0)	(16.2)	(65.1)	(55.6)	(90.3)	(9.51)
Observations	900	960	1599	1599	1606	1606	638	1467	1466	1219	1467	1467
R^2		0.108	0.099	0.148	0.195	0.028	0.075	0.058	0.184	0.033	0.136	0.149
Adjusted R^2		0.102	0.096	0.145	0.192	0.024	0.066	0.054	0.181	0.028	0.132	0.145
Hausman test Prob>chi2	0.1098	0.0000	0.0000	0.0000	0.0000	0.0018	0.0001	0.0000	0.0000	0.0004	0.0000	0.0000
Breusch Pagan Test Prob>chibar2	0.0000											
Wald Test of FE Prob>chi2		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Shaded column estimated with RE estimator due to Hausman consistency test

Due to statistics of Wald test for Heteroskedasticity in FE estimators, robust estimators were estimated for all models.

Table 1.3 – GMM regression of CPI

	Customs and Import Duties	Tax on Trade	Trade-GDP ratio	Total Im.	Goods Im.	Services Im.	Computer Ser. Im.	Food Im.	Fuel Im.	ICT Goods Im.	Manufactur e Im.	Metal Im.
L.Dep. Var.	0.81***	0.73***	0.95***	0.91***	0.88***	0.91***	1.10***	0.68***	0.72***	1.00***	0.89***	0.81***
	(0.072)	(0.082)	(0.041)	(0.050)	(0.074)	(0.14)	(0.089)	(0.050)	(0.052)	(0.19)	(0.046)	(0.062)
L2. Dep. Var.	0.23**	0.29***	0.051	0.087*	0.13*	-0.042	-0.24***	0.17***	0.24***	0.020	0.11***	0.19***
	(0.094)	(0.097)	(0.041)	(0.046)	(0.073)	(0.098)	(0.070)	(0.049)	(0.075)	(0.17)	(0.036)	(0.057)
CPI	-0.0014	-0.0022	0.62	0.0026	-0.0046	-0.0054	-0.18	0.31**	0.060	0.15	-0.59	-0.039
	(0.0014)	(0.0014)	(1.41)	(0.0081)	(0.0064)	(0.0049)	(0.24)	(0.12)	(0.28)	(0.24)	(0.51)	(0.046)
L.CPI	0.0016	0.0023*	0.34	0.0024	0.0080	0.0088*	0.29	-0.26**	0.025	-0.18	0.81	0.069
	(0.0013)	(0.0014)	(1.31)	(0.0075)	(0.0063)	(0.0053)	(0.25)	(0.12)	(0.28)	(0.23)	(0.53)	(0.043)
log of GDP per Cap.	0.054**	0.066*	136.3***	0.87***	0.49**	0.11	0.70	3.91	16.4*	15.5	53.2**	2.33**
	(0.027)	(0.034)	(35.1)	(0.22)	(0.22)	(0.13)	(8.35)	(4.13)	(9.54)	(11.3)	(21.3)	(1.10)
L.log of GDP per Cap.	-0.055**	-0.067*	-136.5***	-0.87***	-0.49**	-0.10	-0.30	-3.87	-16.4*	-15.5	-53.4**	-2.40**
	(0.028)	(0.034)	(35.3)	(0.22)	(0.22)	(0.13)	(8.44)	(4.14)	(9.54)	(11.3)	(21.4)	(1.10)
log of GDP	-0.049	-0.060	-135.3***	-0.89***	-0.49**	-0.18	6.36	-8.18*	-24.7***	-15.1	-45.4**	-2.49**
	(0.030)	(0.038)	(38.4)	(0.25)	(0.21)	(0.14)	(11.1)	(4.18)	(9.17)	(11.2)	(20.7)	(1.19)
L.log of GDP	0.049	0.061	134.7***	0.89***	0.48**	0.18	-6.63	7.96*	24.6***	15.1	45.2**	2.50**
	(0.030)	(0.038)	(38.3)	(0.25)	(0.21)	(0.14)	(11.1)	(4.16)	(9.16)	(11.2)	(20.6)	(1.18)
Gov. Exp.	0.00081**	0.00031	-0.25	0.0015	-0.00030	0.0014	0.0090	0.013	0.080	0.0042	-0.14	-0.016
	(0.00039)	(0.00045)	(0.26)	(0.0018)	(0.0021)	(0.0012)	(0.057)	(0.052)	(0.075)	(0.028)	(0.19)	(0.014)
L.Gov. Exp.	-0.00067	-0.000033	0.0063	-0.0032	-0.0014	-0.0029*	-0.093	-0.035	-0.13*	-0.041	0.028	0.016
	(0.00044)	(0.00048)	(0.29)	(0.0021)	(0.0022)	(0.0016)	(0.069)	(0.052)	(0.079)	(0.031)	(0.20)	(0.014)
Cur. Acc.	0.00015	0.00013	-0.21**	-0.0046***	-0.0054***	-0.0016***	0.0082	-0.030***	-0.071***	-0.044***	-0.31***	-0.010***
	(0.00010)	(0.00013)	(0.10)	(0.00072)	(0.00088)	(0.00047)	(0.086)	(0.0086)	(0.024)	(0.015)	(0.033)	(0.0035)
L.Cur. Acc.	-0.000070	0.00000074	0.30***	0.0053***	0.0052***	0.0019***	-0.017	0.026***	0.075***	0.036***	0.34***	0.014***
	(0.000080)	(0.00012)	(0.11)	(0.00078)	(0.00068)	(0.00053)	(0.067)	(0.0093)	(0.028)	(0.0099)	(0.033)	(0.0039)
WTO mem.	0.00084	0.0011	-0.26	-0.00030	-0.0041	-0.012**	-0.87**	-0.30**	-0.32	0.074	-0.077	0.017
	(0.00099)	(0.0015)	(0.84)	(0.0049)	(0.0070)	(0.0056)	(0.39)	(0.15)	(0.25)	(0.12)	(0.40)	(0.034)
Constant	-0.0067*	-0.010**	23.9***	0.14***	0.11***	0.14***	5.08**	6.80***	6.30***	0.72	8.30***	0.40*
	(0.0036)	(0.0052)	(8.34)	(0.044)	(0.035)	(0.048)	(2.18)	(1.28)	(1.78)	(0.94)	(3.16)	(0.22)
Observations	706	778	1424	1424	1423	1423	497	1284	1281	975	1284	1284
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Arellano_Bond AR(1) test in first differences Pr>z	0.078	0.004	0.000	0.000	0.001	0.000	0.010	0.000	0.001	0.062	0.000	0.000
Arellano_Bond AR(2) test in first differences Pr>z	0.293	0.211	0.104	0.101	0.648	0.387	0.195	0.221	0.342	0.229	0.569	0.718
Hansen overid. Test Prob>chi2	1.000	1.000	1.000	1.000	1.000	0.958	0.999	1.000	1.000	1.000	1.000	1.000
GMM Excluding group	1.000	1.000	1.000	1.000	1.000	1.000	0.944	1.000	1.000	1.000	1.000	1.000

	Customs and Import Duties	Tax on Trade	Trade-GDP ratio	Total Im.	Goods Im.	Services Im.	Computer Ser. Im.	Food Im.	Fuel Im.	ICT Goods Im.	Manufacture Im.	Metal Im.
GMM Difference	1.000	1.000	1.000	0.000	1.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000
IV Excluding group	1.000	1.000	1.000	1.000	1.000	0.000	0.994	1.000	1.000	1.000	1.000	1.000
IV Difference	1.000	0.999	1.000	0.000	1.000	1.000	1.000	0.999	1.000	1.000	1.000	0.552

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 1.4 – FE and RE estimation of CC

	Customs and Import Duties	Tax on Trade	Trade-GDP ratio	Total Im.	Goods Im.	Services Im.	Computer Ser. Im.	Food Im.	Fuel Im.	ICT Goods Im.	Manufactur e Im.	Metal Im.
CC	0.000008	0.0017	0.74	0.0027	0.00030	-0.0096*	-0.69*	-0.24	-0.69	0.92	1.62	-0.023
	(0.0021)	(0.0034)	(2.61)	(0.014)	(0.0076)	(0.0053)	(0.40)	(0.21)	(0.51)	(0.58)	(1.13)	(0.094)
log of GDP per Cap.	0.018*	0.038**	-5.87	-0.048	-0.037	0.024	11.9***	-0.45	-6.10**	5.23	6.97	0.75
	(0.0095)	(0.017)	(11.2)	(0.066)	(0.031)	(0.032)	(3.70)	(1.39)	(2.58)	(3.29)	(5.56)	(0.54)
Gov. Exp.	0.0011***	0.00062	-0.50	-0.00067	-0.00049	0.00077	0.11	0.053*	-0.093	-0.083**	-0.038	-0.0056
	(0.00021)	(0.00092)	(0.35)	(0.0018)	(0.00068)	(0.0011)	(0.095)	(0.029)	(0.062)	(0.036)	(0.12)	(0.0071)
log of GDP	-0.025***	-0.035***	21.0**	0.11**	0.11***	-0.030	-7.33**	0.071	10.3***	-4.13	-0.45	0.16
	(0.0075)	(0.012)	(8.24)	(0.047)	(0.024)	(0.034)	(2.81)	(1.07)	(2.23)	(2.90)	(4.29)	(0.35)
Cur. Acc.	0.00014*	0.00018	0.069	-0.0035***	-0.0038***	-0.00052	-0.037	-0.036***	-0.075***	-0.029***	-0.24***	-0.0048
	(0.000077)	(0.00015)	(0.11)	(0.00072)	(0.00026)	(0.00041)	(0.046)	(0.0076)	(0.022)	(0.011)	(0.034)	(0.0056)
WTO mem.	-0.0024	-0.0059*	6.86*	0.049**	0.036***	0.014*	-0.79*	0.56	-0.46	0.45	3.70***	0.19
	(0.0025)	(0.0033)	(3.81)	(0.020)	(0.010)	(0.0080)	(0.46)	(0.36)	(0.70)	(0.41)	(1.30)	(0.14)
Constant	0.45***	0.55***	-358.3***	-1.76**	-1.89***	0.60	82.7*	5.30	-190.4***	61.1	-22.6	-8.96*
	(0.11)	(0.16)	(124.0)	(0.69)	(0.35)	(0.59)	(43.6)	(15.1)	(34.5)	(45.3)	(65.0)	(4.80)
Observations	980	1041	1878	1878	1885	1885	809	1646	1645	1319	1646	1646
R^2	0.075	0.045	0.089	0.128	0.168	0.014	0.079	0.047	0.183	0.029	0.115	0.118
Adjusted R^2	-0.066	0.040	0.086	0.125	0.085	0.010	0.072	0.043	0.180	0.025	0.112	0.115
Hausman test Prob>chi2	0.0021	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
Wald Test of FE Prob>chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Due to statistics of Wald test for Heteroskedasticity in FE estimators, robust estimators were estimated for all models.

Table 1.5 – GMM regression of CC

	Customs and Import Duties	Tax on Trade	Trade-GDP ratio	Total Im.	Goods Im.	Services Im.	Computer Ser. Im.	Food Im.	Fuel Im.	ICT Goods Im.	Manufactur e Im.	Metal Im.
L.Dep. Var.	0.85***	0.77***	0.96***	0.90***	0.92***	0.83***	0.54	0.68***	0.72***	1.01***	0.90***	0.80***
	(0.081)	(0.080)	(0.046)	(0.052)	(0.079)	(0.094)	(0.39)	(0.046)	(0.054)	(0.20)	(0.048)	(0.066)
L2. Dep. Var.	0.18*	0.26***	0.041	0.094**	0.091	0.080	0.070	0.16***	0.25***	0.012	0.10***	0.20***
	(0.10)	(0.088)	(0.045)	(0.046)	(0.076)	(0.086)	(0.25)	(0.054)	(0.077)	(0.17)	(0.037)	(0.061)
CC	-0.00016	0.0063	0.68	0.0076	-0.0025	0.027	2.16	0.093	-0.94	0.72	1.16	-0.18*
	(0.0021)	(0.0042)	(3.68)	(0.028)	(0.016)	(0.021)	(1.94)	(0.27)	(0.64)	(0.56)	(1.11)	(0.10)
L.CC	0.00076	-0.0056	-0.38	-0.0044	0.011	-0.023	0.46	-0.14	0.91	-0.72	-0.97	0.20**
	(0.0021)	(0.0038)	(3.76)	(0.029)	(0.015)	(0.021)	(1.10)	(0.26)	(0.63)	(0.50)	(1.18)	(0.10)
log of GDP per Cap.	0.0057	0.012	60.6*	0.32*	0.36	0.076	61.5	1.01	16.1*	15.3	32.9	2.91*
	(0.024)	(0.042)	(35.7)	(0.19)	(0.23)	(0.15)	(59.9)	(4.83)	(9.05)	(12.3)	(21.3)	(1.71)
L.log of GDP per Cap.	-0.0069	-0.013	-59.9*	-0.32*	-0.36	-0.072	-62.2	-0.86	-16.2*	-15.4	-32.8	-2.96*
	(0.024)	(0.042)	(35.9)	(0.19)	(0.23)	(0.15)	(60.6)	(4.87)	(9.02)	(12.3)	(21.4)	(1.72)
log of GDP	0.0032	-0.0053	-56.4	-0.33*	-0.33	-0.19	-53.3	-4.85	-25.0***	-14.4	-21.5	-2.67
	(0.024)	(0.039)	(38.5)	(0.20)	(0.23)	(0.20)	(58.7)	(5.08)	(8.72)	(11.6)	(21.5)	(1.72)
L.log of GDP	-0.0026	0.0057	56.2	0.33	0.33	0.18	52.9	4.62	25.0***	14.4	21.5	2.70
	(0.023)	(0.039)	(38.5)	(0.20)	(0.23)	(0.20)	(58.6)	(5.08)	(8.71)	(11.6)	(21.5)	(1.72)
Gov. Exp.	0.00083**	0.00023	-0.43*	-0.00031	-0.0013	-0.00057	-0.20	0.011	0.10	-0.033	-0.27	-0.026*
	(0.00038)	(0.00053)	(0.24)	(0.0017)	(0.0014)	(0.00053)	(0.22)	(0.051)	(0.087)	(0.040)	(0.16)	(0.014)
L.Gov. Exp.	-0.00057	0.00015	0.36	-0.00032	0.00032	-0.00088	-0.087	-0.028	-0.11	0.0080	0.20	0.025*
	(0.00050)	(0.00062)	(0.24)	(0.0016)	(0.0013)	(0.00057)	(0.17)	(0.045)	(0.082)	(0.041)	(0.17)	(0.014)
Cur. Acc.	0.00019*	0.00013	-0.25**	-0.0048***	-0.0053***	-0.0014***	0.065	-0.034***	-0.077***	-0.054***	-0.34***	-0.011***
	(0.00011)	(0.00016)	(0.11)	(0.00073)	(0.00079)	(0.00029)	(0.12)	(0.0084)	(0.026)	(0.016)	(0.037)	(0.0033)
L.Cur. Acc.	-0.000078	0.0000036	0.25**	0.0048***	0.0052***	0.0015***	-0.081	0.021***	0.081***	0.044***	0.31***	0.013***
	(0.000090)	(0.00015)	(0.11)	(0.00068)	(0.00077)	(0.00030)	(0.097)	(0.0077)	(0.030)	(0.011)	(0.035)	(0.0041)
WTO mem.	0.00082	0.00089	-0.21	-0.0011	-0.0056	-0.0064	-2.13*	-0.18	-0.11	-0.0065	-0.19	0.036
	(0.0010)	(0.0013)	(0.78)	(0.0051)	(0.0067)	(0.0043)	(1.09)	(0.15)	(0.20)	(0.12)	(0.31)	(0.033)
Constant	-0.0082	-0.0059	8.06	0.079**	0.11**	0.071***	21.2	5.78***	5.17***	-0.19	1.78	-0.058
	(0.0065)	(0.0080)	(7.49)	(0.040)	(0.048)	(0.027)	(14.1)	(1.34)	(1.59)	(1.29)	(3.41)	(0.31)
Observations	627	683	1282	1282	1278	1278	243	1099	1096	1006	1099	1099
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Arellano_Bond AR(1) test in first differences Pr>z	0.082	0.079	0.000	0.006	0.000	0.058	0.000	0.000	0.001	0.059	0.000	0.000
Arellano_Bond AR(2) test in first differences Pr>z	0.986	0.609	0.249	0.318	0.389	0.262	.	0.631	0.192	0.242	0.620	0.643
Hansen overid. Test Prob>chi2	1.000	1.000	1.000	1.000	1.000	1.000	0.957	1.000	1.000	1.000	1.000	1.000
GMM Excluding group	1.000	1.000	1.000	1.000	1.000	1.000	0.921	1.000	1.000	1.000	1.000	1.000

	Customs and Import Duties	Tax on Trade	Trade-GDP ratio	Total Im.	Goods Im.	Services Im.	Computer Ser. Im.	Food Im.	Fuel Im.	ICT Goods Im.	Manufactur e Im.	Metal Im.
GMM Difference	1.000	1.000	1.000	1.000	1.000	1.000	0.797	1.000	1.000	1.000	1.000	1.000
IV Excluding group	1.000	1.000	1.000	1.000	1.000	1.000	0.923	1.000	1.000	1.000	1.000	1.000
IV Difference	0.999	1.000	1.000	1.000	1.000	0.997	0.828	1.000	1.000	1.000	1.000	0.900

Standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

According to Table 1.5, the following results are suggested while they have similar interpretations with the CPI category. Coefficients of log of GDP per capita are statistically significant in trade GDP ratio, total imports, fuel imports, and metal imports. Log of GDP has statistically significant negative impact on total imports and fuel imports. Government expenditures increase customs and import duties significantly, while they decrease trade GDP ratio and metal imports. Current account balance variable has statistically significantly negative coefficient in the first protectionism measure. This variable has statistically significantly positive coefficients for all of trade openness and imports equations except for the computer services imports. Being a WTO member does not statistically affect any of the dependent variables, except a decrease in the computer services imports.

1.7. Conclusion

In this chapter, I study the impact of corruption on international trade and the level of trade protectionism. Two sets of data for corruption from two different sources were used. The impacts of corruption on two measures of trade protectionism, total trade, total imports, imports of goods, imports of services, and some subgroups of imports were analyzed. Because of endogeneity, country specifics effects, time fixed effect, and heteroskedasticity problems in the estimations, methods other than normal OLS were applied to achieve robust and consistent results. Fixed effect and random effect estimators were used in the first step neglecting the endogeneity problems. In the second step, GMM was used to control for most of the regression problems. Endogeneity problem in the regressions of corruption seems to be very significant because of a huge difference between the outcomes of GMM and panel estimations of FE and RE. Therefore, results of the regressions with usage of instrumental variables are preferred to the ones without instruments.

The results of the GMM regressions of both categories of data show that corruption has no impact on trade protectionism. Corruption surveyed by Transparency International website has a negative impact on current food imports. On the other hand, corruption measured by World Governance Indicators has a positive current effect on metal imports. Special interest groups are attracted to food according to CPI and they are attracted to metal products according to CC.

Another interesting conclusion can be related to the trustworthiness of sources of corruption data. The data for corruption of the two sources are compiled by the surveys among some organizations in the world. The most important outcome is that the estimation results over these two databases are not equivalent. This mainly suggests that assigning corruption levels and rankings for the countries in the world are not equivalently surveyed by the two sources. It can be even a matter of taste for those organizations measuring the data. Their accountabilities are not questioned with the results of this study; nevertheless, they seem to observe corruption from different aspects. Perhaps the aspects of WGI surveyors are different from those of Transparency International. Because of differences in the results of the two sources, either both of the two sources are not showing the real situations of corruption or one of them at least is

not. However, this research is not aimed to judge the sources of corruption data but this was a slight comparison of the two sources.

2. Welfare Analysis of a Prohibitive NTM in a Society with a Proportion of Concerned Consumers

Abstract: The aim of this contribution is to provide a cost-benefit analysis in a partial equilibrium framework to investigate the welfare consequences of a non-tariff measure (NTM). The important issue of the analysis is having two groups of indifferent and concerned consumers. The ultimate aim of the research is to investigate whether or not the paternalistic behavior of government is in line with the willingness of the consumers for demand. The existence of information about the origin of goods is the leading issue of the analysis that provides two different scenarios. The model is calibrated with data on consumption of shrimps. The findings suggest that in the existence of such information, NTM policy has the lowest international losses and highest domestic gains. The policy implication of these results suggests that governments should try to increase the information in the market when they are following good faith for imposition of NTM.

2.1. Introduction

Since General Agreement on Tariffs and Trade (GATT) in 1948, tariffs on trade between the World Trade Organization (WTO) members have fallen. However, non-tariff measures (NTMs) have received worldwide/global attention. Multi- Agency Support Team (MAST)[10] described NTMs as follows:

"Non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both." (MAST, 2008)

According to the classification of World Integrated Trade Solution (WITS) in February 2012, NTMs include 16 categories of which the first and second are most frequently used for notification by WTO members. The Sanitary and phytosanitary (SPS) measures, and Technical Barriers to Trade (TBT) are respectively the first and second categories described in WITS. According to WITS, SPSs are measures that are applied for the aim of: protecting human or animal life from risks arising from additives, contaminants, toxins or disease-causing organisms in their food; protecting human life from plant- or animal-carried diseases; protecting animal or plant life from pests, diseases, or disease-causing organisms; preventing or limiting other damage to a country from the entry, establishment or spread of pests; and protecting bio-diversity. These include measures taken to protect the health of fish and wild fauna, as well as health of forests and wild flora. According to the same source, TBTs are "measures referring to

[10] (MAST) as of July 2008 comprise institutional members: Food and Agriculture Organization of the United Nations (FAO), International Monetary Fund (IMF), International Trade Centre UNCTAD/WTO (ITC), Organization for Economic Cooperation and Development (OECD/TAD), United Nations Conference on Trade and Development (UNCTAD), United Nations Industrial Development Organization (UNIDO), World Bank (WB), World Trade Organization (WTO). Observers: European Commission (EC), and United States International Trade Commission (USITC), United States Department of Agriculture (USDA). UNCTAD and World Bank jointly coordinate MAST. MAST reports to the Group of Eminent Persons, which is convened by the director general of UNCTAD.

technical regulations, and procedures for assessment of conformity with technical regulations and standards, excluding measures covered by the SPS Agreement."

These measures have attracted worldwide/global attention: The World Trade Report (2012) specifically discusses them and analyzes their impact on the international trade. They have been very effective instruments for the governments to follow different motivations. There can be three reasons for imposition of these regulatory measures. Firstly, NTM can serve as a public policy and not as an economic issue, which concerns protection of human health or safety, animal or plant life or health, or the environment. For instance, within a TBT or SPS measure, a foreign product with negative effects on the consumers is restricted from importation because consumers are not well informed about the harmful attributes of that product. Thus, the NTM policy mainly should increase consumer welfare of the domestic society.

Secondly, from economical aspect of view, NTM might focus on the increase of social welfare to correct market failures without implementation of discrimination in trade. It can be a case that both producer and consumer welfare will be improved by the imposition of new regulations. Since the government does not introduce import tariffs, there is no revenue for the government. However, WTO allows such NTM that also fulfills the first reasoning.

Thirdly, it can be caused by a pure political economy that aims to intervene free trade to support special interest groups without even increasing consumer welfare, which leads to the protectionism of the domestic industry. This motivation is addressed as protection for sale in the literature (Grossman and Helpman, 1992; Goldbe and Maggi, 1997). In fact, social welfare is changed by the summation of domestic producer surplus increase and government utility improvement induced by the support of lobbying industry.

The first two reasons show good faith by the governments is supported in the agreements of WTO. However, the last one can unnecessarily hamper trade and violate the articles related to NTMs. In other words, special interest groups who are lobbying with corrupted governments might persuade them to break international rules and provide some protectionism measures for them. However, in the first chapter of this thesis, I found no statistically significant linkages between corruption and level of protectionism or level of trade. TBT, SPS, and other agreements of WTO cover logical frameworks for impositions of NTMs. They give justifiable authority to members for implementation of their own standards that are not discriminatory. Governments might claim protection of their population using NTM while they might truly protecting their own economy or industry at the expense of economies and trade of other countries.

In general, new standards and new regulations that are imposed in the context of NTMs have quite effective impacts on international trade. When a government imposes a new standard, foreign industries should adopt themselves to these standards in order to get permission to export to that country. However, the new standards are mostly in line with the domestic industries' productions. In the beginning, if the standards are not in line with foreign industries, their export will be halted until they comply themselves to these new regulations. If the modification of production procedure is not affordable by those foreign industries, they will simply lose one of their markets and they often ask their own governments to take the legitimate

actions within international regulations and WTO agreements. Sometimes, it takes a long time to convince the imposing government to eliminate the policy or even comply with the current agreements if violated.

Governments pursuing good faith mostly provide scientific and justifiable reasons for the implementation of TBTs and SPSs. Paternalistic behavior of the governments consider the protection of their own nation against outdated standards that allowed importation of some products with negative characteristics. The new standards and regulations in the focus of the NTMs try to faithfully increase the quality of life of the consumers. However, it is very rare that governments follow the true requests from their own consumers. In fact, the paternalistic attitude does not allow consumers to intentionally choose their own characteristics of the product while decisions are made on their behalf. Some consumers do not care about bad properties of products and some are not even informed about them. Nevertheless, governments take the decisions of imposition of new standards for higher qualities whether or not the policy is in line with international agreements.

When the new NTMs are imposed to increase the safety of products, pattern of trade and importation will dramatically change. Foreign competitive rivals that could not afford the new standards are then out of the domestic market, and only those firms producing in line with new regulations remain in the market. It takes a definite period of time that foreign industries keep up with new standards and modify their own production procedures. During this period, the market structure becomes less competitive and consumers indifferent or unaware of negative characteristics of products in line with outdated standards will bear a cost.

The aim of this chapter is to provide a theoretical framework to analyze and quantify the welfare changes in a country imposing prohibitive NTMs, when consumers classified into indifferent and concerned ones. Paternalistic behavior of the government can be better judged after such analysis. Moreover, when majority of domestic consumers are concerned about the negative properties of the foreign product, government policies seem to be more justifiable in the context of international regulations and WTO agreements. In itself, it can be good technical evidence in addition to scientific proof behind imposition of NTMs. In the next section, a brief literature review on the issue accompanying an anecdotal fact will be provided. In the third section, the basic analysis of the theoretical model will be done. The effective welfare changes of the country imposing NTM will be elaborated in the fourth section. Fifth section will present the application and calibration of data. Finally, conclusions and the possible extensions of the model will be discussed in the sixth section.

2.2. Anecdotal fact and literature review

In September 1998, Canada requested for consultation (DS144) with the United States within Dispute Settlement Mechanism (DSM) with respect to certain measures, imposed by the US state of South Dakota and other states, prohibiting entry or transit to Canadian trucks carrying cattle, swine, and grain. Since then, this Dispute Settlement (DS) case had been pending

according to the WTO website[11]. Canada and Mexico requested consultation with the United States of America concerning the mandatory Country Of Origin Labelling (COOL) within cases DS384 and DS386 respectively in December 2008. These two cases seem to be similar to the complaint by Canada in DS144. European Union countries (27 member states) with 12 other countries reserved their third party rights in these disputes. COOL was believed to be discriminatory within the framework of WTO agreements. After some years of analyzes and investigation in the DSM, the Appellate body issued its findings in June 2012. The USA was proved to violate Article 2.1[12] of TBT agreement and promised to implement the rulings and recommendations of Dispute Settlement Body (DSB) until May 2013. Figure 2-1 can show the changes of swine export from Canada to the USA.

Figure 2-1 – Export of swine from Canada to the USA during 1996-2012

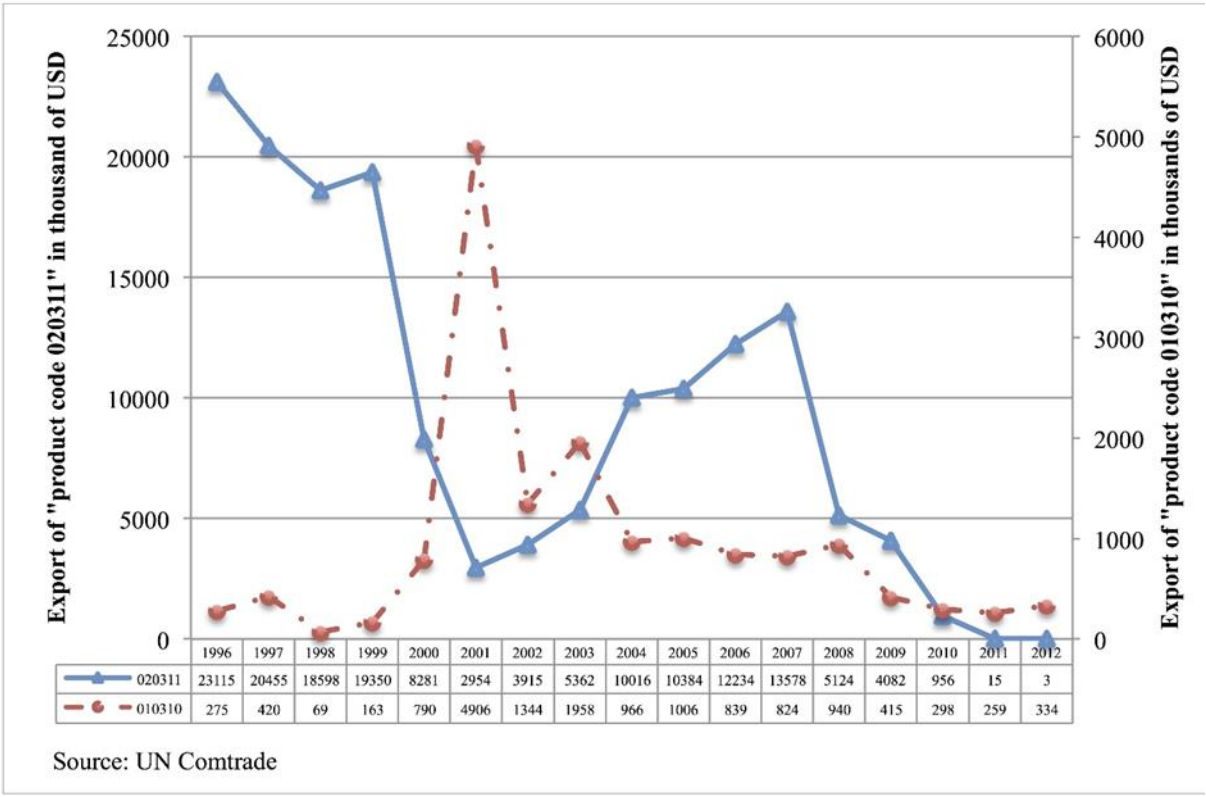


Figure 2-1 shows the export trends of "live swine, purebred and breeding" with Harmonized System (HS) code (revision 1996) 010310 in the right vertical axis (dashed line with round nodes); and "meat of swine, fresh or chilled" with HS-1996 020311 in the left vertical axis (solid line with triangular nodes) from Canada to the USA. As it is observed in the above example, export of meat of swine has dropped dramatically in 1999 (after DS144). Then in 2001 export of live swine has jumped dramatically, which seems to be a substitute for meat of swine. However, export of live swine dropped after one year and gradually decreased until 2012. After 2001 export of meat of swine has been gradually increased but in 2007 (before

[11] Can be found at: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds144_e.htm

[12]Article 2.1 of the TBT agreement is "Members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favourable than that accorded to like products of national origin and to like products originating in any other country."

DS384) it dropped dramatically. As it is observed, the main reason for the decrease of swine export from Canada can be the prohibitive NTM imposed by US.

To the date of the writing of this research, it will take two more months for the rulings of DSB to be implemented by the US. The first significant effect of this policy was prohibition of the importation of some products from Canada. Even if the industries of Canada had tried to implement the regulations of the USA, it would have taken a long time to comply with them.

In order to quantify welfare implications of NTM policies, cost and benefit analysis are conducted within the framework of partial equilibrium. Paarlberg and Lee (1998) used a numerical partial equilibrium approach to find the linkages between the Foot-and-Mouth Disease (FMD) risky products imported to the US and the level of protectionism. They simply modeled the surplus changes of consumers and producers, and a government maximizing welfare by assigning the optimal tariff. Then they calculated the output losses after the outbreak by assigning a probability to its risk.

Maskus et al. (2000) described briefly DS requests during 1995-2000 citing TBT and SPS agreements. They shortly reviewed the literature on the role and effects of standards on trade. They stated that surveys, econometric studies, partial equilibrium studies, and computable general equilibrium studies are the general frameworks of the research on the issue.

Thilmany and Barret (1997) studied the effects of technical regulations on the export of food products from US to other North American Free Trade Agreement (NAFTA) countries. They assumed in their model that both demand and supply curves are shifting upwards after the imposition of new standards. In fact, the costs of producers increase to comply with new standards and supply curve shifts up. Moreover, new standards increase the quality of the products, and all consumers become more certain about the new good characteristics of the product. Therefore, consumers' utility increases and the demand curve shifts up. This assumption is simply on the basis of homogenous consumers that are all concerned about the negative characteristics of products.

Van Tongeren et al. (2009) conduct a modular partial equilibrium model that focuses on demand and supply relationships. Changes in social welfare were analyzed in three different scenarios; Prohibitive standard that completely brings the market into autarky (NTM), free trade, and mandatory labeling that provides complete information of the goods to the consumers. These three scenarios were considered for the effects on consumers, producers, and for global commons externalities. Although, they stated that they also modeled the externalities of the products, it seems that they only modeled negative direct characteristics of the product, and not the indirect externalities.

Aisbett and Pearson (2013) suggested that governments are following good motivations for imposition of SPS and it is mainly due to the importance of healthcare and environmental qualities in those imposing countries. However, it is still necessary to analyze if the governments are pursuing the requests of their nations and not their own paternalistic decisions.

Beghin et al. (2012) provided a framework similar to van Tongeren et al. (2009). They considered only two scenarios of informed consumers and uninformed consumers about the

negative characteristics of foreign products. They assumed that informed consumers are also concerned consumers. They found that the prohibitive standards increase the international welfare. When consumers are unaware of negative attributes of products, only foreign producer's welfare decreases slightly, while domestic producer and consumers gain from the regulation. When consumers are completely informed, all of these agents gain from the new standards. The important weaknesses about their theoretical approach are: Firstly, addressing informed consumers as also concerned ones because preferences do not imply information; Secondly, negative externalities of consumption are not clearly identified, and only negative direct characteristics of the foreign product are introduced in their model. Negative externalities can be discussed when consumption or production of a product by an agent that gives her positive utility or profit decreases utility or profit of another agent indirectly; Thirdly, they assumed that consumers could not distinguish between foreign and domestic products, yet they are assumed to consider a share of foreign products on total products of the market in their utility functions; Fourthly, when they cannot distinguish between the two products, consumers can rationally assign probabilities to the share of foreign products in the market and then make decisions.

This study is a similar contribution to Beghin et al. (2012) and van Tongeren et al. (2009) with some modifications. Here, it is assumed that consumers are aware of negative characteristics of the products but they can be indifferent or concerned about them. However, in two different scenarios existence of the information for consumers to distinguish the origin of products will be altered. NTM policies are strictly prohibitive and they halt the import of foreign products with damaging attributes, which is the situation before the improvement of foreign production procedures. The market structure in this model differs from those two references, meaning that here under free trade the home country has an oligopolistic market. Oligopolistic competition instead of perfect competition can provide a clearer situation in which the government uses consumers' safety as an excuse to impose NTM even though the real reason is to increase domestic industry's welfare. The findings of this study can clarify the motivation of the government behind the imposition of NTMs. In fact, the analytical framework discussed in the following can show whether the government is actually increasing consumers' welfare by the restrictive measure.

2.3. Basic analyzes of the model

For simplicity, I assume there are two countries, Home country (H) and Foreign country (F). Domestic consumers and producers and foreign producers are addressed as the main agents of this model. It is assumed that the foreign product contains some negative characteristics that might cause damages to human health, animal life, and environmental qualities. Some domestic consumers might be concerned about these negative attributes and internalize them in their preferences. A domestic government that tries to protect its own population against the harms of foreign product imposes a prohibitive NTM that increases the standard of the product. Domestic industry has been producing in line with new standards. Foreign producers need to comply with the new regulations, in order to be able to export to the home market, and it takes

a period of time. In this model, it is tried to analyze the domestic welfare changes after imposition of an NTM during the time that the foreign product is not imported to the home market because of lower qualities before the foreign industry complies with the new standards.

The domestic country has a population of N_H. Demand of each consumer, $i = \{1, \dots, N\}$, from a quasi-linear utility function of a good can be easily derived. Considering quadratic preferences of the good and an additive numeraire, the utility function of each domestic consumer for a product is as follows:

$$U_i(q_i, w_i) = aq_i - \overline{b}\, q_i^2/2 - Ir_i q_i + w_i \qquad (2.1)$$

Where w_i is the utility of the numeraire good, term $aq_i - \overline{b}\, q_i^2/2$ is the satisfaction of consumer i from consuming quantity q_i of a good. $r_i q_i$ is the supposed damage of the product, which might be focused by the technical policy or new regulations. In order for concerned consumers to demand the product with negative characteristics, it is simply assumed that $r_i < a$. Term I represents the concerned knowledge of the consumer regarding the damage of the product. Therefore, if the good is not accounted harmful for the consumer, this term will equal to zero. Conversely, if $I = 1$, it will mean that the consumer will be concerned about the negative properties of the good. Overall, term $Ir_i q_i$ captures the impacts of concerned harm about a good for the representative consumer. Even if the product is potentially harmful for human consumption, it is assumed for indifferent consumers that the internalized positive satisfaction of that product compensates for the expected potential harm in the future completely. Cigarette smoking can be an example of that. Therefore, preferences are only subjective and they are capturing only the perception of satisfaction. A concerned consumer (decision maker or social planner) might think that indifferent consumer's preferences are subjective, but indifferent people themselves think of it as an objective utility function. Harm of a person in the society is unrelated to others (no indirect externalities of products assumed), and only satisfaction of consumption is the only factor in preferences of indifferent consumers. They simply do not think about harm, diseases, or death; and that is why they are labeled indifferent.

There are two types of people in the society. $\eta = N_1/N$ is the proportion of the population who are indifferent to the negative characteristics of the good. It means that $Ir_i q_i = 0$ for $i = 1, \dots, N_1$. The rest of the society is concerned about the damaging effect of the product, which comprises $1 - \eta = 1 - (N_1/N)$ proportion of the population. Thus, for $= N_1, \dots, N$, $Ir_i q_i = Irq_i > 0$, where "r" is the average of "r_i" in the group of concerned consumers.

Demand functions can easily be derived after maximizing the above utility function with respect to a budget constraint: $pq_i + w_i = y_i$. Where p presents the price of the respected good, y_i stands for the income of the representative agent i, and price of the numeraire is equal to 1.Consumers do not know the true (subjective) probability of getting the product with bad characteristics; they simply act as if the probability of consuming foreign good is equal to 1. Therefore, the demand function for the consumer is: $q_i(p) = (a - p - Ir_i)/\overline{b}$. Considering aggregate demand of all consumers as $Q = \sum_{i=1}^{N} q_i\,(p)$, and assuming $b = \overline{b}/N$, the inverse aggregate demand for each group of people in the society will be of the form:

$$p_1^D(Q) = a - (b/\eta)Q \quad \text{indifferent consumers}$$
$$p_2^D(Q, I) = a - Ir - [b/(1-\eta)]Q \quad \text{concerned consumers} \tag{2.2}$$

Equation (2.2) suggests that when these two groups of society are equally distributed ($\eta = 0.5$) and they demand and consume the same amount of products, concerned consumers are willing to pay a lower price than indifferent consumers. The disutility from the harmful attributes in the products induces a lower willingness to pay for the second group of consumers than for the indifferent ones. In other words, when the market has only one segment for both groups with a unique price, concerned consumers demand and consume less products than indifferent ones.

The supply side of the market is an oligopolistic competition between the two industries of both countries[13]. It is assumed that the foreign industry produces a product with lower quality and less costs than the domestic firm does. However, since there are transportation costs for the exportation of foreign products, it is simply assumed that each firm has similar cost functions. In other words, cost of transportation is included in the cost of the final good imported from the foreign supplier. Industries are maximizing their outputs with respect to a quadratic cost function in output. Considering $Q = \sum_{i=1}^{N} q_i\,(p)$, the profit for each industry is:

$$\pi_j = p(Q)q_j - \frac{1}{2}cq_j^2 - K, \text{ for } j = \{H, F\} \tag{2.3}$$

Where c is the variable cost parameter, and K is the sunk cost related to the market entry. Since symmetry in both countries is assumed, this equation is equivalent for both. Considering Cournot oligopoly game, production strategies of the producers can be calculated in two scenarios. The difference between the two scenarios is the existence of information. In the first scenario, it is assumed that consumers have incomplete information about the origin of the products, while in the second scenario consumers can distinguish the origin of the products. In fact, in the first scenario government does not try to provide a situation in which consumers can distinguish the two products. Even after imposition of the NTM government does not inform them about the new regulations. In the second scenario, government tries to implement a policy like mandatory labeling of products, which is assumed to be costless for industries, in order to induce consumers to choose the products rationally. However, in both scenarios the media and scientists inform all people that the foreign product has some negative characteristics.

2.3.1. Scenario 1

2.3.1.a. Benchmark

In the beginning, there is free trade in the market. Products are not differentiated and consumers have incomplete information, thus they cannot recognize the origin of the product in order to figure out which of the products have the damaging effect. Besides, as explained earlier they

[13]It is simply assumed that there exists one industry in each country; each industry acts as a monopoly in autarky even if it comprises various firms (think of a cartel).

assign probability 1 for getting products with negative characteristics. Total demand of the home country can be derived from (2.2) as follows:

$$Q^D(p) = \begin{cases} \frac{\eta}{b}(a-p), & a-r < p \leq a \\ \frac{a-(1-\eta)r}{b} - \frac{1}{b}p, & p \leq a-r \end{cases} \tag{2.4}$$

When damaging effect of the good perceived by the concerned individual is so big such that $r \geq a$, then only η of the total population demand for goods. This means that concerned consumers do not risk themselves by buying the goods that are mixed with the harmful products. If we assume that $r < a$, then concerned consumers also demand products even with negative characteristics; thus the producers maximize their profits with respect to (2.4). After calculating their best strategies for production and Nash equilibrium strategies in this game, total output of this oligopoly with price p_{O1A}^S is:

$$Q_{O1A}^S = \begin{cases} \frac{2a\eta}{3b+c\eta}, & a-r < p \leq a \\ \frac{2(a-(1-\eta)r)}{3b+c}, & p \leq a-r \end{cases} \tag{2.5}$$

Now consider an NTM policy that prohibits the import of goods from abroad. Simply assume that it as a high sunk cost imposed to the foreign firm that induces exit from the home market. The market goes to autarky and a single monopoly supplies the product domestically[14]. In this case, it is assumed that consumers are not informed about the imposition of NTMs and the new standards, and they still think that there exists one product from two different producers. The reason behind this is that from the beginning they did not have complete information to even distinguish between the two products' origins[15]. Hence, after maximization of profit, the output of the monopolist with price p_{M1A}^S is as follows:

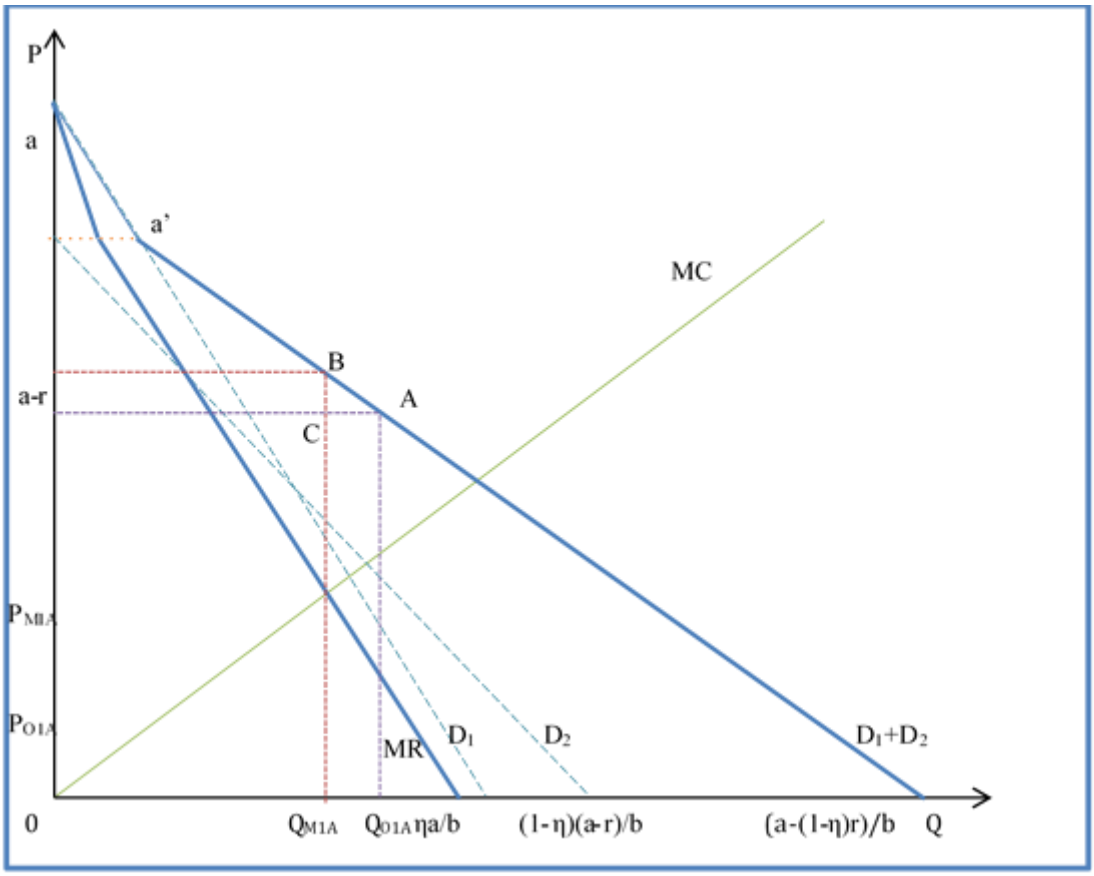
$$Q_{M1A}^S = \begin{cases} \frac{a\eta}{2b+c\eta}, & a-r < p \leq a \\ \frac{a-(1-\eta)r}{2b+c}, & p \leq a-r \end{cases} \tag{2.6}$$

Figure 2-2 shows this case using demand and supply curves. D_1 shows the demand curve for indifferent individuals and D_2 represents the demand curve for concerned consumers. Here it is assumed that $\eta < 0.5$ and D_1 has a sharper slope, meaning that concerned consumers are majorities. However, the opposite situation does not alter/affect the outcomes of the analysis. This simply means that indifferent consumers' demand is less elastic in changes of prices in

[14]Previously there has been an example that led to the dispute settlement in the WTO.
[15]However, we can in addition think of an NTM in addition to mandatory labeling of the product, then, consumers will get the complete information and they exclude the disutility from their preferences. They simply know that there will be no more foreign product and this case will change to a new case.

comparison with concerned consumers' demand. The only winner with such policy is the domestic producer and government does not gain any revenue from such policy.

Figure 2-2 - Equilibrium in Scenario 1

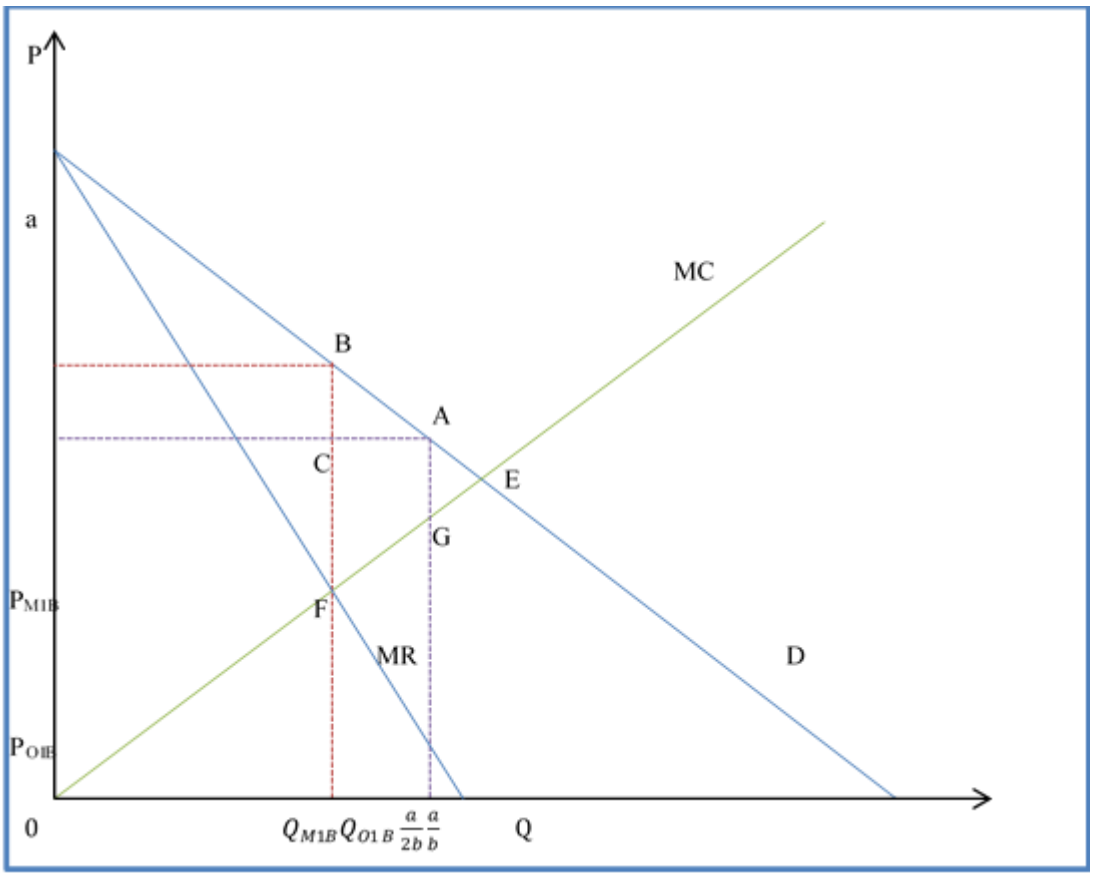


2.3.1.b. Extreme case A

Assume that all consumers of the home country are indifferent about the negative characteristics of the product, thus, $\eta = 1, Ir = 0$. Therefore, industries face the inverse demand function $p^D(Q) = a - bQ$. After profit maximization and considering best response functions for the industries, Nash equilibrium solution to this strategic game is $q_H = q_F = a/(3b + c)$. Total supply of the two industries will be$Q^S_{O1B} = q_H + q_F$ with p_{O1B} as the equilibrium price.

Now consider a new regulation imposed as an NTM to trade that halts the import from the foreign producer completely. In this case, domestic firm acts as a monopoly and maximization of its profit yields new output$Q^S_{M1B} = q_H = a/(2b + c)$ and price p_{M1B}. Points A and B are showing the equilibrium prices and quantities for, respectively, oligopoly before imposition of NTM and monopoly after imposition of NTM.

Figure 2-3 – Equilibrium in Scenario 1, extreme case A



2.3.1.c. Extreme case B

In this case assume that all consumers of the home country are concerned about the negative characteristics of the product, thus, $\eta = 0;\ Ir > 0$. Domestic consumers know that the foreign product has the damaging effect while the domestic product is not harmful at all. Products are not differentiated and consumers think that the products with different characteristics are mixed. Hence, they demand both products, but not at the same level as the previous case. The total demand from the previous case is decreased and the demand schedule is shifted downward by r. If consumers are very concerned and consider a huge amount of disutility from the consumption of the good, meaning that $r \geq a$, then the shift of the curve is so big that they do not demand anything. Nevertheless, here it is assumed that in spite of the disutility endured by consumers, there is still demand for the product in the market (a $> r$).

Therefore, industries face the inverse demand function $p^D(Q) = a - r - bQ$. After profit maximization and considering the best response functions for the industries, the Nash equilibrium solution of this strategic game is $q_H = q_F = (a - r)/(3b + c)$. Total supply of the two firms will be $Q^S_{O1C} = q_H + q_F$ with equilibrium price p_{O1C}.

Now consider a new regulation imposed as a non-tariff measure to trade that halts importation from the foreign producer completely. If the government informs them about the new regulations, this case after imposition of NTM will become equivalent to the previous case of this scenario, where $Ir = 0$. Since the consumers are not informed about this new policy, the

demand function schedule will not change. Hence, the domestic firm acts as a monopoly and maximization of its profit yields a new output, $Q^S_{M1C} = q_H = (a-r)/(2b+c)$ with price p_{M1C}.

Figure 2-4 – Equilibrium in scenario 1, extreme case B

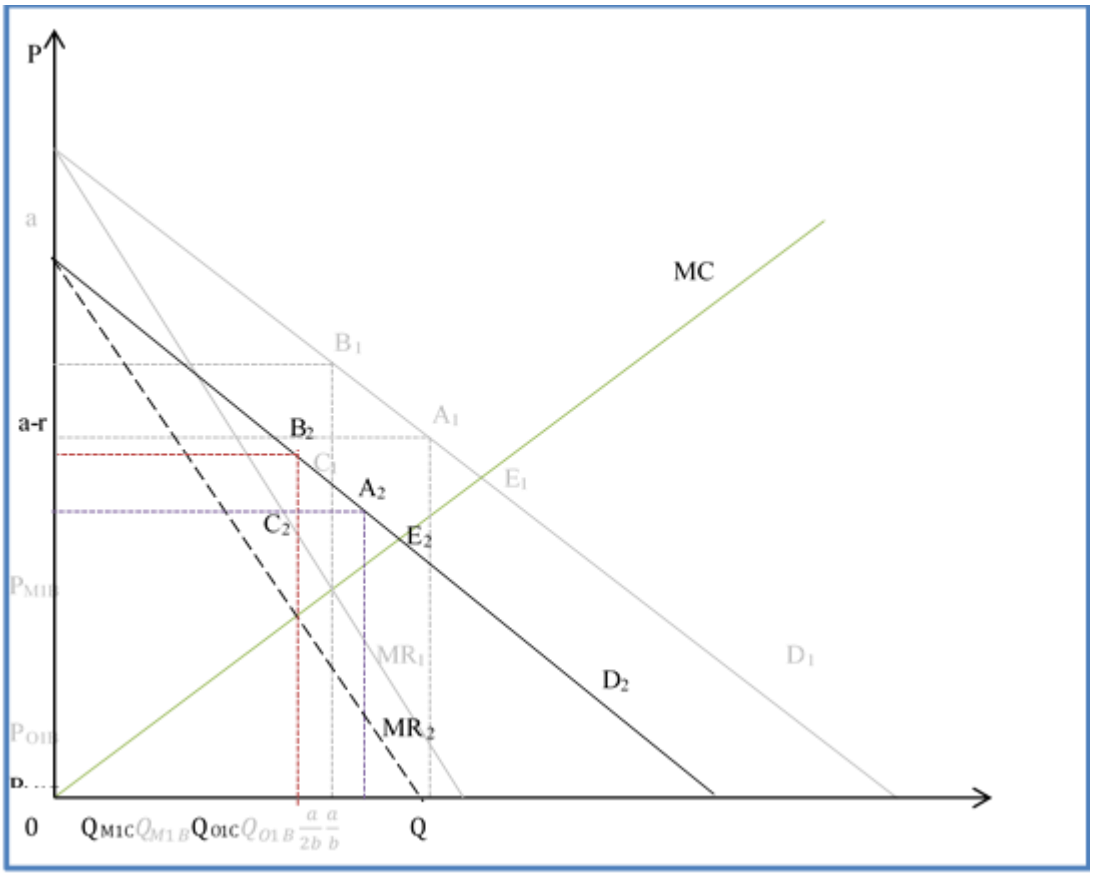


Figure 2-4 depicts the new curves and points for this scenario with index 2, while the ones related to the previous case are with subscript 1 and they are in gray color. The demand curve D_2 has shifted downward from D_1 by the amount r. The oligopoly supply in this case is more than the oligopoly supply in the first extreme case, but less than the oligopoly in the benchmark of this scenario. However, the rest of the explanations are similar to those mentioned for the first scenario.

It is crucial to pay attention to the changes of social welfare in this case and compare it to the ones obtained in previous case. The increased profit of the domestic producer after imposition of NTM here is smaller than the one in Figure 2-3. Volatilities of the social welfare are decreased because: Firstly, consumers do not have complete information about the product supplied in the market; Secondly, they have fear for being affected by the foreign product that is mixed with the safe product in their bundle of goods. Welfare in this extreme case is decreased from the previous case before imposition of the NTM because the whole demand has been decreased due to lack of information, which is a market imperfection. As it was mentioned earlier, this case happens when consumers cannot distinguish between the two products. If they are informed about this, they will assuredly demand only the domestic product in a monopolistic market while their demand will be similar to the one in the previous case.

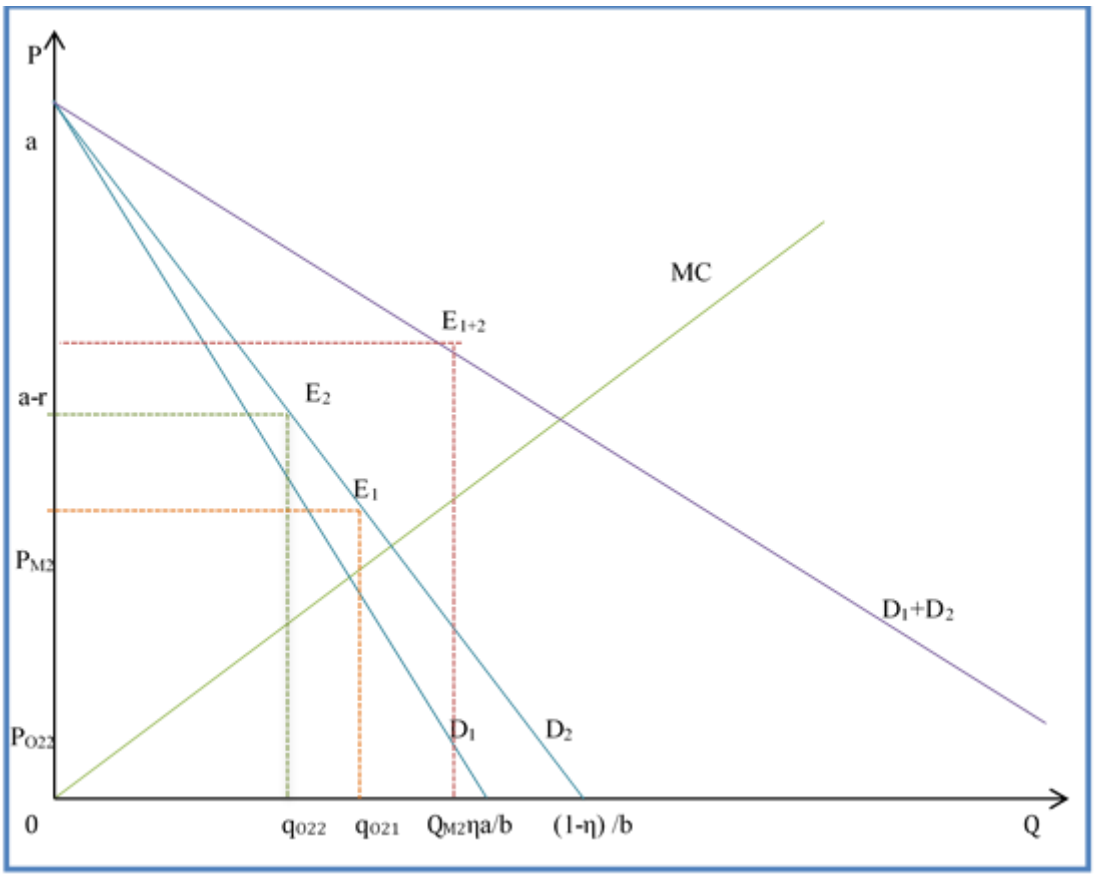
2.3.2. Scenario 2

2.3.2.a. Benchmark

There are both types of individuals in this scenario; a proportion of people that are indifferent about the negative characteristics of the foreign good and the rest of the population that are concerned about that ($\eta \in (0,1)$). Since the demand is segmented as shown in equation (2.2), it is important to know which of the two types of population is larger.

There is free trade in the market and people have complete information about the characteristics of the goods including the place of origin. In this case, concerned people that include "$1-\eta$" share of the population consume and demand only domestic products. Indifferent individuals demand goods with any characteristics. As mentioned earlier, for simplicity it was assumed that the two industries have similar costs ($c_H = c_F$), and there is no cost of transportation. Therefore, if both industries want to compete in the market, they should have the same prices for both segments. Domestic producer will act as a monopoly in response to the demand of concerned consumers in equation (2.2). On the other hand, the demand of indifferent consumers is responded to by a supply from both industries. Since monopoly imposes higher prices than oligopoly, the concerned consumers should pay more as they want to reject negative characteristics of foreign product.

Figure 2-5 – Equilibrium in Scenario 2



It might seem impractical that a firm supplies the exact same product with two different prices within one market. Nevertheless, this happens in reality as a marketing strategy of a firm. For instance, a dairy producer sells its own products in its own shops while selling its products under the marketing brand of a wholesaler or retailer in another big shop, in which different brands of dairy are also sold. In order to compete with other firms, the company does not like to lose the market share in huge international retailers and it is forced to show its existence. This may suggest that this marketing strategy might result in lower profits but greater turnover and customer satisfactions. Since it was mentioned that there is complete information of the product, it can be assumed that this information is delivered to consumers via a mandatory labeling of the good's characteristics. However, industries are not obliged to mention positive characteristics of their products but negative properties. They can even describe the properties of the product including the place of origin, but within a new trademark. For further simplicity, it is assumed that the home producer has the same cost function for both marketing strategies and bears no cost for creating a new trademark for concerned consumers.

Domestic industry's profit is the summation of profit from both segments of the market. Assume that; p_{O21} is the price of good for indifferent consumers, p_{O22} is the price of good for concerned consumers, q_{H1} is the supply of good of the home producers for the indifferent individuals, q_{H2} represents the supply of good of the domestic firm for concerned consumers, and q_{F1} indicates the supply of good for indifferent consumers imported from abroad. Since concerned consumers have perfect information due to the labeling of the product, they feel no disutility in consuming the domestic product. Thus, damaging characteristics from equation (2.1) can be excluded and $Ir = 0$. For simplicity in the calculations, it is assumed that both groups have the same population ($\eta = 0.5$). After calculation of best strategies of both industries, a Nash equilibrium leads to the following supply of industries:

$$q_{H1} = \frac{\eta ab}{3b^2 + 2c^2\eta^2 + 4bc\eta}$$

$$q_{F1} = \frac{2\eta ab^2 + 2ac^2\eta^3 + 4abc\eta^2}{(2b + c\eta)(3b^2 + 2c^2\eta^2 + 4bc\eta)} \qquad (2.7)$$

$$q_{H2} = \frac{3\eta ab^2 + 2ac^2\eta^3 + 3abc\eta^2}{(2b + c\eta)(3b^2 + 2c^2\eta^2 + 4bc\eta)}$$

As it is observed in equations (2.7), quantities supplied by the two industries are different from each other. The total supply for indifferent consumers is $q_{O21} = q_{H1} + q_{F1}$.

Now consider an NTM that prohibits the import of goods from the industry abroad. Again, the home country acts as a monopolist in response to total demand of the consumers. As mentioned earlier, since consumers have complete information, they will also be informed about the exit of the foreign firm from the domestic market (think of the lack of foreign labels of products). Consequently, individuals are not exposed to the negative characteristics of foreign goods and

$Ir = 0$. Therefore, the home industry maximizes its production function and supplies output, $q_{M2}^{S} = \frac{a}{2b+c}$, with price, p_{M2}^{S}.

Figure 2-5 illustrates this case with demand curves. In this figure, it is assumed that the population of concerned consumers is higher than that of the indifferent consumers, in order that their demands do not coincide for better observation. As depicted, E_1, E_2 are the equilibrium for, respectively, the indifferent individuals and the concerned consumers before policy implementation. E_{1+2} is the equilibrium point after the imposition of NTM. It is observed that consumer surplus for the first group of people was very big before policy and after that, total consumer surplus of the population seems to be relatively smaller. Detailed changes of welfare will be studied in the next section.

2.3.2.b. Extreme case A

When all consumers are indifferent about the negative characteristics of the foreign product, this scenario is simply reduced to a one demand function where $Ir = 0$, similar to the extreme case A of the first scenario.

2.3.2.c. Extreme case B

Since consumers know that the foreign product is harmful and they are all concerned about the negative impacts of that good, they simply do not buy the foreign product because they can easily distinguish the origin of products. In other words, there is no demand for the good produced abroad. The foreign firm cannot compete in the home market. The home industry acts as a monopolist in the market and chooses point B in Figure 2-3 as the equilibrium price and output. However, in this case there is no difference between the time before the imposition of new regulations and after it. Because all of the domestic consumers prefer only the product produced domestically and this policy cannot change their behavior. It can be assumed that preferences for the domestic good is presented by equation (2.1) when $Ir = 0$.

2.4. Welfare changes analysis

In this section, I will investigate detailed changes of welfare for each case and scenario described above. Assuming that the consumers own the domestic industry, total social welfare is the sum of individuals' utilities and firms' profits. Consumer welfare is actually defined by an individual's assessment of her own satisfaction given prices and income. Since the demand curve captures such assessment, with quasi-linear utility, consumer welfare can be calculated as consumer surplus, which is the area below the demand curve and above the price.

For Producer Surplus (PS), the famous definition in the literature is focused here, which is the excess of gross receipt (total revenue) over total variable costs. This is the area between price and the supply of the producer. Since I want to observe changes of Consumer Surplus (CS) and firm's surplus, I will analyze them separately and then study the total welfare changes. In fact, I want to study relative changes between the two sides of market and in proportion of the total welfare variations. For the next section, it is important to see if the imposition of NTM policy by the government was mostly in favor of consumers or the producer. This issue is very related

to the share of concerned consumers of the population and the damaging properties of the foreign product.

It is quite important to mention that NTMs carry a higher dead-weight loss than tariffs do. Since government receives no taxes or tariffs from the policy, there is no gain for the government after NTM. In the following subsections, calculation of PS and CS will be discussed. Summation of producer and consumer surpluses is the total welfare change of the domestic society, which will be calibrated in the next section. Besides, PS, before imposition of NTM is equal to the foreign producer surplus in scenario 1, because two industries are symmetric. Therefore, the international welfare changes will simply be a deduction of the initial producer surplus in oligopoly from the total domestic welfare changes. In the second scenario, the two industries do not have the same surplus for the first segmentation of the market because their productions are different from each other. Hence, the international welfare changes will be a deduction of foreign industry surplus from the total domestic welfare changes.

2.4.1. Scenario 1

2.4.1.a. Benchmark

Consumer welfare changes:

Consumers' welfares before the imposition of NTM (CS_{O1A}) and after new regulations (CS_{M1A}) are respectively the area p_{01A} Aa'a and p_{M1} Ba'a in Figure 2-2 (for simplicity it was assumed that $p \leq a - r$, i.e. what is depicted in that figure). Total consumer welfare changes in this case are as follows:

$$\Delta CS_{1A} = CS_{M1A} - CS_{O1A} = \left[\left(\frac{a-(1-\eta)r}{2b+c}\right)^2 - \left(\frac{2(a-(1-\eta)r)}{3b+c}\right)^2\right]\frac{b}{2} \qquad (2.8)$$

Equation (2.8) is always negative as the first term in the square brackets is always smaller than the second term. To check the effective changes of surplus in percentages it is better to calculate policy elasticity of CS. Policy elasticity of consumer surplus simply defines percentage changes in consumer surplus with respect to percentage changes of policy, in which the latter equals to one (imposition of a policy means changes from no policy to action, zero to one). For the rest of this study, the equivalent definition holds for consumer and producer surplus. Policy elasticity of consumer surplus for this scenario is as follows:

$$\frac{\Delta CS}{CS_{O1A}} = \frac{CS_{M1A}}{CS_{O1A}} - 1$$
$$= \frac{(3b+c)^2\left[b(a-(1-\eta)r)^2 + 2(2b+c)^2(1-\eta)\frac{\eta r^2}{2b}\right]}{2(2b+c)^2\left[2b(a-(1-\eta)r)^2 + (3b+c)^2(1-\eta)\frac{\eta r^2}{2b}\right]} - 1 \qquad (2.9)$$

It is not easy to simplify equation (2.9). However, extreme cases can simplify it, which will be discussed in next cases. Moreover, the calibrated value will determine the value of (2.9) in the next section of this chapter.

Producer welfare changes:

Total producer welfare changes will simply be a deduction of PS before imposition of the regulations (PS_{O1A}) from the new PS after NTM (PS_{M1A}), which is as follows:

$$\Delta PS_{1A} = PS_{M1A} - PS_{O1A} = \frac{(5b^2 + 2bc)(a - (1-\eta)r)^2}{2(2b + c)(3b + c)^2} \quad (2.10)$$

This value is positive if $a > (1-\eta)r$. According to the assumptions of this scenario (for calculation of eq. (2.5), if we want to have concerned consumers in the market, "*a*" should be strictly greater than "*r*". Since $r > (1-\eta)r$; therefore, $a > (1-\eta)r$ holds as long as concerned consumers have positive demand of products, and eq. (2.10) is positive.

Policy elasticity of producer surplus is also as follows:

$$\frac{\Delta PS_{1A}}{PS_{O1A}} = \frac{PS_{M1A}}{PS_{O1A}} - 1 = \left(\frac{3b + c}{2b + c}\right)^2 - 1 \quad (2.11)$$

As it is observed, there is neither "η" nor "*r*" in the calculation of eq. (2.11), which suggests that policy elasticity of domestic producer depends neither on the negative characteristic of foreign product nor on the consumers concerns about that. Therefore, this equation also holds for extreme cases A and B.

2.4.1.b. Extreme case A

Consumer welfare changes:

Consumers' welfares before and after the imposition of NTM are, respectively, "CS_{O1B}" and "CS_{M1B}"equivalent with areas p_{01B}Aa and p_{M1B} Ba in Figure 2-2. Total consumer welfare changes will be:

$$\Delta CS_{1B} = CS_{M1B} - CS_{O1B} = \left[\left(\frac{a}{2b + c}\right)^2 - \left(\frac{2a}{3b + c}\right)^2\right] * \frac{b}{2} \quad (2.12)$$

Similarly to equation (2.8), equation (2.12) is always negative. Policy elasticity of consumer surplus is shown in the next equation:

$$\frac{\Delta CS}{CS_{O1}} = \frac{CS_{M1}}{CS_{O1}} - 1 = \frac{9b^2 + c^2 + 6bc}{16b^2 + 4c^2 + 16bc} - 1 \quad (2.13)$$

Consumer surplus deviation to the initial consumer welfare ratio in (2.13) shows the percentages change of consumer surplus in response to the policy; and it is the simplified version of equation (2.9), in which $\eta = 1$. It is easily observable that this ratio is negative, and furthermore, it is perceived that the new regulations that prohibit the import of goods from

abroad decrease the consumer welfare. This is mainly due to the change of the market structure from oligopoly to monopoly, where fewer quantities of the good are supplied with a higher price to the people who are indifferent about the characteristics of this good. In other words, in an oligopoly with two firms, the average variable cost is lower than in a monopoly with one firm.

Producer welfare changes:

Total producer welfare changes are simply the PS before the new regulations (PS_{O1B}) subtracted from the PS after these NTMs (PS_{M1B}):

$$\Delta PS_{1B} = PS_{M1B} - PS_{O1B} = \frac{5a^2b^2 + 2a^2bc}{2(2b+c)(3b+c)^2} \quad (2.14)$$

This is simplified version of equation (2.10) with $\eta = 1$ and is positive. As explained in the benchmark policy, elasticity of producer surplus is similar in all three cases of this scenario.

2.4.1.c. Extreme case B

Consumer welfare changes:

CSs before the imposition of NTM (CS_{O1C}) and after NTM (CS_{M1C}) are respectively the area p_{01C} A_2a-r and p_{M1C} B_2a-r in Figure 2-4. Total changes of CS are as follows:

$$\Delta CS_{1C} = CS_{M1C} - CS_{O1C} = \left[\left(\frac{a-r}{2b+c}\right)^2 - \left(\frac{2(a-r)}{3b+c}\right)^2\right]\frac{b}{2} \quad (2.15)$$

Similar to equation (2.8), equation (2.15) is always negative. CS changes in this case (eq. (2.15)) are smaller than the changes in the previous case (eq. (2.12)), but smaller than the change in the benchmark (eq. (2.8)). Policy elasticity of consumer surplus in this case is exactly equal to the one in the previous case (eq. (2.13)). This means that consumer surplus variations have decreased from the previous case at the same level as the initial CS (before NTM) and final CS (after NTM) have decreased from the previous scenario. This shows that imposition of new regulations will change the consumer surplus of the two extreme cases with the same elasticity. In other words, incomplete information of consumer does not change the situation for the government to impose new regulations for two cases. All consumers' concerns about the product cannot alter the consequences of welfare changes after the government interventions from the situation that all consumers are indifferent. In fact, when the whole society is concerned about the negative properties of the foreign product, imposition of new regulations changes their welfare relative to their initial situation at the same level as if they were indifferent about the foreign product. This finding is closely equivalent to the benchmark (eq. (2.9)). Therefore, in this scenario policy elasticity is equal in all cases for any values of η.

The reason behind this finding is mainly that they have incomplete information and are ignorant about the prohibitive regulation by the government. Their preferences will not change after the new regulations because they still believe that there exists foreign product in the market.

However, if they become informed about the policy, they will remove the negative effects of bad products from their preferences; then, the policy elasticity will differ in two extreme cases.

Producer welfare changes:

Total producer welfare changes are simply PS before imposition of the regulations (PS_{O1C}) subtracted from PS after the NTMs (PS_{M1C}), which is as follows:

$$\Delta PS_{1C} = PS_{M1C} - PS_{O1C} = \frac{(5b^2 + 2bc)(a-r)^2}{2(2b+c)(3b+c)^2} \tag{2.16}$$

Eq. (2.16) is positive if $a > r$, which was assumed from the beginning to imply that concerned consumers wanted to stay in the market. Policy elasticity of producer surplus in this case is exactly equal to the respective value in previous case and the benchmark (eq. (2.10))

2.4.2. Scenario 2

2.4.2.a. Benchmark

Consumer welfare changes:

Since the market is segmented between the two groups of consumers, total consumer welfare should be the sum of the CS from the two segments ($CS_{O2} = CS_{O21}$+CS_{O22}). First segment is for the indifferent consumers while the second segment is for the concerned consumers. Total CS changes will be calculated separately for each segment; then their summation will show the total CS changes. In other words, subtracting total CS before regulations (CS_{O2}) from new CS after NTM (CS_{M2}) will give the total CS changes. First line of the following equations (ΔCS_{21}) refers to the variations of CS for the indifferent consumers and the second line (ΔCS_{22}) refers to the changes of welfare for the concerned consumers:

$$\begin{aligned} \Delta CS_{21} &= CS_{M21} - CS_{O21} = \left(\frac{a}{2b+c}\right)^2 \frac{\eta b}{2} - \frac{b}{2\eta} q_{O21}^2 \\ \Delta CS_{22} &= CS_{M22} - CS_{O22} = \left(\frac{a}{2b+c}\right)^2 \frac{(1-\eta)b}{2} - \frac{b}{2(1-\eta)} q_{O22}^2 \end{aligned} \tag{2.17}$$

Because of the complexity of the second terms in both lines of equation (2.17), it is not easy to see the signs of the changes of consumer welfare. Thus, calibration of data can better determine them.

Policy elasticity of consumer surplus for each segment of the market is as follows:

$$\frac{\Delta CS_{21}}{CS_{O21}} = \frac{CS_{M21}}{CS_{O21}} - 1 = \frac{\left(\frac{a}{2b+c}\right)^2 \frac{\eta b}{2}}{\frac{b}{2\eta} q_{O21}^2} - 1 \tag{2.18}$$

$$\frac{\Delta CS_{22}}{CS_{O22}} = \frac{CS_{M22}}{CS_{O22}} - 1 = \frac{\left(\frac{a}{2b+c}\right)^2 \frac{(1-\eta)b}{2}}{\frac{b}{2(1-\eta)} q_{O22}^2} - 1$$

Producer welfare changes:

Total producer welfare changes are simply the subtraction of PS before NTM (PS_{O2}) for both segments from the PS after the new regulations (PS_{M2}), which will be the changes of domestic producer profit after NTM, which will be as follows:

$$\begin{aligned} \Delta PS_2 &= PS_{M2} - PS_{O2} \\ &= a(q_{M2} - q_{H1} - q_{H2}) + b\left(\frac{1}{\eta} q_{O21} q_{H1} + \frac{b}{1-\eta} q_{H2}^2 - Q_{M2}^2\right) \\ &+ \frac{c}{2}((q_{H1} + q_{H2})^2 - Q_{M2}^2) \end{aligned} \qquad (2.19)$$

Equation (2.19) and the policy elasticity of domestic consumer will be calibrated in the next section to see the exact effect of NTM on the producer welfare changes. The foreign industry simply loses its surplus after imposition of new regulations, which will be as follows:

$$\Delta PS_{F2} = k - \pi_{F2} = b q_{O21} q_{F1} + \frac{c}{2} q_{F1}^2 - a q_{F1} \qquad (2.20)$$

2.4.2.b. Extreme case A

When all consumers are indifferent about the negative characteristics of the foreign product, this scenario is simply reduced to a one demand function where $Ir = 0$, similar to the extreme case A of the first scenario.

2.4.2.c. Extreme case B

All of the consumers are concerned about the damaging characteristics of the foreign product and they only use the domestic good since they have complete information about it. Thus, there is no change in the welfare of consumers before and after imposition of new regulations. Changes in consumer and producer surplus are equal to zero in this case.

2.5. Application and calibration of data

Beghin et al. (2012) calibrated data for consumption of shrimps in France. Their data for demand and supply of shrimps in 2006 for European Union will be used in the calibration. They also conducted a consumer choice experiment in December 2009 in Paris, France. Their random survey sample included 160 participants for the consumption of shrimps including the imported shrimps with antibiotics treatment that can have health hazards. They finally found that the

average per-unit damage perceived by the participants "*r*" is equal to 47 percent of the price of the product[16]. The summary of the data they provided is presented in Table 2.1.

Table 2.1 – Data on consumption of shrimps in 2006

Variable	Description	Data for EU-15
Q	Consumption (in thousands of tons)	523.166
P	Price per kg (US$)	6.29
ε_D	Own-price elasticity of demand	-0.67
$r_{\%}$	Per-unit damage of product (in percentages)	47%

Source: Beghin et al. (2012), Table 1, page 369

To simply calculate parameters, extreme case A of the first scenario will be the standard for calibration. In fact, it is assumed that the data presented in Table 2.1 capturing the real world is equivalent to that case. Therefore, it is simply assumed that the real market in European Union is a duopolistic competition between domestic producers and non-EU industries that are symmetric. Moreover, it is assumed that EU citizens are all indifferent about negative characteristics of shrimps produced out of EU (treated with antibiotics) at the time data was collected. Thus, other scenarios are alterations to this case and changes of parameters will be considered afterwards. Table 2.2 presents the calculation of parameters of the model, using the data provided by Beghin et al. (2012). Calculations of parameters are also shown in this table. Since there was no data on the cost function of shrimps suppliers, marginal costs are simply calculated such that there is duopolistic market clearing in the benchmark model.

Table 2.2 – Calculated parameters of the model on consumption of shrimps in 2006

Variable	Calculation	Description	Value for EU-15
b	$b = P/(\varepsilon_D * Q)$	Slope of demand	0.018
a	$a = b * Q + P$	Demand intercept	15.68
c	$c = (2a/Q) - 3b$	Marginal cost of production in duopolistic market clearing	0.006
r	$r = P * r_{\%}$	Valuation of the damage (US$)	2.96

Source: own calculations according to the data by Beghin et al. (2012)

[16]Their survey is biased because they did not consider those consumers indifferent about the damaging characteristics of the shrimps treated with antibiotics. They simply made an average on the total willingness to pay (WTP) of the consumers, if the prices varying from €0.25 to €4. The WTP before revelation of information regarding the damaging attributes of product was in average 2.14, and after revelation of information was 1.13. Then by the relative variation they found that "r" is about 47% of the price of the product.

2.5.1. Calibration

Table 2.3 – Calibration Results

Welfare	**Scenario 1,** (η = 0.5)	**Scenario 1,** (η = 1)	**Scenario 1,** (η = 0)	**Scenario 2,** (η = 0.5)
CS_{O21}				1253.74
CS_{O22}				662.58
CS_O	2075.40	2455.76	1616.94	1916.33
CS_M	1086.94	1250.80	823.56	1250.8
ΔCS_{21}				-628.35
ΔCS_{22}				-37.18
ΔCS	-988.46	-1204.96	-793.38	-665.53
$\frac{\Delta CS_{21}}{CS_{O21}}$				-0.50
$\frac{\Delta CS_{22}}{CS_{O22}}$				-0.6
$\frac{\Delta CS}{CS_O}$	-0.48	-0.49	-0.49	-0.35
PS_O	1178.50	1436.62	945.91	1828.43
PS_M	2400.98	2926.86	1927.14	2926.86
ΔPS	1222.49	1490.25	981.22	1098.43
$\frac{\Delta PS}{PS_O}$	1.04	1.04	1.04	0.60
ΔW	234.03	285.29	187.84	432.9
$\Delta IntW$	-944.47	-1151.33	-758.07	-413.74

Source: own calculation

Table 2.3 shows the calibration results for the two scenarios. As shown, changes of CS and international welfare are negative in all scenarios and cases. The magnitude of these changes is highest in extreme case A of first scenario, and lowest in scenario 2. It would be wiser to compare the two benchmark cases and then the interpretation of extreme cases can be derived from them.

When consumers have enough information to freely make their own decision on choosing the product that maximizes their own utility (scenario 2.2), their initial welfare is lower than the

corresponding welfare for the situation in which they cannot identify the origin of products so as to choose what they want ($CS_{O2} < CS_{O1A}$). However, after imposing new restrictions on the import, the welfare in scenario 2 is higher than the first scenario, which is equal to the extreme case 1 of first scenario ($CS_{M2} = CS_{M1B} > CS_{M1A}$). As it is observed both groups of consumers are losing after imposition of NTM in the second scenario. Nevertheless, total consumer welfare losses in the second scenario are less than corresponding changes in the first scenario. Even the policy elasticity of consumer surplus is better for the second scenario.

With respect to the initial and final PS, the domestic producer has also a better situation in the second scenario relative to the first scenario. Policy elasticity of PS shows that producers are enjoying new regulations in the second scenario less than in the first scenario. Total welfare increase and total international welfare decrease present a better situation when the information about the origin of the products is available for consumers. Calibration of the model suggests that informing consumers puts the international welfare changes in a better situation than not informing them. Foreign industry's losses in the second scenario (-846) are lower than the best situation in the extreme case B of first scenario (-945). Lack of information is one of the market failures and the findings therefore suggest that an increase of information assuredly improves the market behavior in response to a trade policy.

In general, it can be concluded that when market efficiencies are improved and there is available information for consumers, their welfare has a better situation than when there is not enough information. Even after a prohibitive NTM that decreases the competitiveness within the market, when there is complete information for consumers, there are fewer losses than when consumers cannot identify the origins of the products. Knowledge on the origins of the products can inform them (consumers) about the characteristics of the product which can be internalized in their preferences. In all cases studied in this chapter, total social welfare of the society has increased while the consumers made losses. Domestic producer's gains relative to its initial surplus in scenario 2 are much lower than in scenario 1 (60% relative to 104%). In both cases, government might have imposed NTMs to support the domestic industry instead of protecting consumers. However, when government tries to inform consumers about the characteristics of products (scenario 2) from the beginning, it can suggest that officials are actually pursuing safety of society. In other words, by not informing the society and only by providing scientific evidences about harmful effects of foreign products for the imposition of NTMs governments are relatively seeking to maximize domestic industry's profits. Observing transparent and enough information in the market of a country can be a good but not sufficient proof that the government is trying to protect public safety. Hence, before acceptance of an NTM by international organizations or by other countries, efforts of the government to provide transparency in its domestic market should first be observed. Nevertheless, special interest groups lobbying with governments prefer a lower increase in their profits with monopolistic power rather than an oligopolistic competition with foreign industries.

2.6. Conclusions

In this chapter, I provide a partial equilibrium framework to analyze the welfare consequences in a country imposing NTM on a specific product produced abroad with negative characteristics that effects only concerned consumers directly. The intuition behind was mainly to show whether the paternalistic behavior of governments is in line with the willingness of the consumers. To support the idea of the possibility to protect the domestic industry that is lobbying the government, oligopolistic market was studied before imposition of NTM rather than a perfect competition. Two scenarios were the focus of analysis, which are mainly differing in the existence of information in the market. It was assumed in both scenarios that awareness of consumers about negative characteristics of foreign products is informed through media and scientific channels. However, existence of information means that they can distinguish between the origins of the goods, which is provided by the government only in the second scenario.

Changes in the welfare after imposition of a prohibitive NTM that restrict the foreign product with negative characteristics have been analyzed in this chapter. Calibration of the data simplified the analysis and provided interesting outcomes that are in line with the assumptions of the model. It was proved that when consumers have enough information about the origin of products, a prohibitive NTM decreases their surplus less than when they cannot distinguish between products with bad and good attributes. Moreover, in the case of complete information producers are gaining less than when there is incomplete information in the market. This suggests that when government tries to increase efficiencies of the market by spreading the information to consumers, the officials are seeking for the public safety more than seeking for protection of the domestic industry. In a scenario when there is not complete information, increase in the producer's profits is greater than the scenario when there is complete information. However, findings from this study cannot evidently define the motivations behind imposition of NTMs. Because in none of the scenarios studied here, government increases domestic welfare of consumers. Hence, they cannot state it as their own motivations.

Possible extensions to this model can be done by: Firstly assigning probabilities for the consumption of two types of products in preferences of concerned consumers when there is incomplete information about the products; Secondly, externalities can be added to the preferences instead of direct negative effects of the products, which can be used to analyze the welfare implications of NTM focusing on products with negative indirect externalities; Thirdly, conducting a similar analysis on welfare changes after the foreign industry endured some costs to comply with new regulations and entered the home market; Fourthly, undertaking a suitable experimental survey that captures assumptions of the model and provides a good data for calibration of parameters is significantly advised.

2.7. Appendix for Calculations

2.7.1. Scenario 1, Benchmark

Best response functions of the home and foreign industries:

$$BR_H(q_F)\colon q_H = \begin{cases} \dfrac{a\eta}{2b+c\eta} - \left(\dfrac{b}{2b+c\eta}\right) q_F, & a-r < p \le a \\ \dfrac{a-(1-\eta)r}{2b+c} - \left(\dfrac{b}{2b+c}\right) q_F, & p \le a-r \end{cases}$$

$$BR_F(q_H)\colon q_F = \begin{cases} \dfrac{a\eta}{2b+c\eta} - \left(\dfrac{b}{2b+c\eta}\right) q_H, & a-r < p \le a \\ \dfrac{a-(1-\eta)r}{2b+c} - \left(\dfrac{b}{2b+c}\right) q_H, & p \le a-r \end{cases} \tag{2.21}$$

Total quantity supplied (Q_{O1A}^S) and price (p_{O1A}^S) before NTM

$$Q_{O1A}^S = \begin{cases} \dfrac{2a\eta}{3b+c\eta}, & a-r < p \le a \\ \dfrac{2(a-(1-\eta)r)}{3b+c}, & p \le a-r \end{cases}$$

$$p_{O1A}^S = \begin{cases} a - \dfrac{2ab}{3b+c\eta}, & a-r < p \le a \\ [a-(1-\eta)r]\left(1 - \dfrac{2b}{3b+c}\right), & p \le a-r \end{cases} \tag{2.22}$$

Total quantity supplied (Q_{M1A}^S) and price (p_{M1A}^S) after NTM in autarky

$$Q_{M1A}^S = \begin{cases} \dfrac{a\eta}{2b+c\eta}, & a-r < p \le a \\ \dfrac{a-(1-\eta)r}{2b+c}, & p \le a-r \end{cases} \tag{2.23}$$

$$p_{M1A}^S = \begin{cases} a - \dfrac{ab}{2b+c\eta}, & a-r < p \le a \\ [a-(1-\eta)r]\left(1 - \dfrac{b}{2b+c}\right), & p \le a-r \end{cases} \tag{2.24}$$

Consumers' welfare before the imposition of NTM:

$$CS_{O1A} = \frac{2b(a-(1-\eta)r)^2}{(3b+c)^2} + (1-\eta)\frac{\eta r^2}{2b} \tag{2.25}$$

Consumer's welfare after the imposition of NTM:

$$CS_{M1A} = \frac{b(a-(1-\eta)r)^2}{2(2b+c)^2} + (1-\eta)\frac{\eta r^2}{2b} \tag{2.26}$$

Producer welfare before imposition of the regulations:

$$PS_{O1A} = \frac{(a-(1-\eta)r)^2(2b+c)}{2(3b+c)^2} \tag{2.27}$$

Producer surplus in the prohibitive regulation:

$$PS_{M1A} = \frac{(a-(1-\eta)r)^2}{2(2b+c)} \tag{2.28}$$

Calculations of extreme case A and B are simplifications of above calculations.

2.7.2. Scenario 2

Profit of the home industry is different because of segmentations of the market, while the foreign industry has similar profit the same as previous scenario (equation (2.3) in the main text). Therefore, profit of home industry is:

$$\pi_H = p_1(q_{H1}+q_{F1})q_{H1} + p_2(q_{H2})q_{H2} - \frac{1}{2}c(q_{H1}+q_{H2})^2 - K \tag{2.29}$$

Maximization of domestic industry's profit with respect to q_2:

$$\frac{\partial \pi_H}{\partial q_2} = 0 \Leftrightarrow\ q_2 = \frac{a(1-\eta)}{2b+c(1-\eta)} - \frac{c(1-\eta)}{2b+c(1-\eta)}q_{H1} \tag{2.30}$$

Best response functions of the home and foreign industries:

$$\begin{aligned} BR_{H1}(q_{F1}): \frac{\partial \pi_H}{\partial q_{H1}} = \frac{\partial \pi_H}{\partial q_2} = 0 \ \Leftrightarrow\ q_{H1} \\ = \frac{a\eta\big(2b+c(1-\eta)\big) + ac\eta(1-\eta)}{(2b+c\eta)\big(2b+c(1-\eta)\big) + c^2(1-\eta)} \\ - \frac{b\big(2b+c(1-\eta)\big)}{(2b+c\eta)\big(2b+c(1-\eta)\big) + c^2(1-\eta)}q_{F1} \end{aligned} \tag{2.31}$$

$$BR_{F1}(q_{H1}): q_{F1} = \frac{a\eta}{2b+c\eta} - \left(\frac{b}{2b+c\eta}\right)q_{H1}$$

3. Non-Tariff Measures and the Quality of Imported Products

Abstract: Eight Multilateral Rounds of negotiations under GATT and international agreements under WTO have contributed significantly to the reduction of tariffs among WTO members. However, legitimate reasons for the imposition of non-tariff measures (NTMs) within regulations have triggered their extensive use over the years. Among these measures, Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Measures (SPS) allow countries to impose restrictions on the imports of low-quality products suspected to harm the domestic consumers' health or the global environment. Such trade policy instruments might induce higher standards in the import market, in addition to improving the market efficiency by information requirements such as mandatory labelling. In this paper, quality improvement of the traded products are analyzed which can provide a guideline for the motives behind different types of NTMs. Based on a model framework involving both supply and demand sides of trade, the paper assesses the impact of different types of NTMs on the quality of the imported products. The analysis modifies and uses the existing information on the NTM notifications to the WTO from the Integrated Trade Intelligence Portal (I-TIP) during 1995-2011.

3.1. Introduction

Eight Multilateral Rounds of negotiations under GATT and international agreements under WTO have contributed significantly to the reduction of tariffs among WTO members. However, legitimate reasons for the imposition of non-tariff measures (NTMs) within regulations have triggered their extensive use over the years. Aiming at trade liberalization, protectionist and discriminatory motives for trade policy measures are not permitted by the regulations, while some specific motives are endorsed in good faith behind NTMs. Among these measures, Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Measures (SPS) allow countries to impose restrictions on the imports of low-quality products suspected to harm the domestic consumers' health, global environment, safety, etc. Such trade policy instruments might induce higher standards in the import market, in addition to improving the market efficiency by information requirements such as mandatory labelling. In this paper, we analyze the quality improvement of the imported products. This provides a guideline for the motives behind different types of NTMs. Applying a monopolistic competition framework involving both supply and demand sides of trade; we will assess the impact of different types of NTMs on the quality of the traded products at 4-digit level of Standard International Trade Classification (SITC) rev. 2. The analysis modifies and uses the existing information on the NTM notifications to the WTO from the Integrated Trade Intelligence Portal (I-TIP) during 1995-2011.

According to the MAST[17] classification, *"Non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on*

[17] (MAST) as of July 2008 comprise institutional members: Food and Agriculture Organization of the United Nations (FAO), International Monetary Fund (IMF), International Trade Centre UNCTAD/WTO (ITC), Organization for Economic Cooperation and Development (OECD/TAD), United Nations Conference on Trade and Development (UNCTAD), United Nations Industrial Development Organization (UNIDO), World Bank (WB), World Trade Organization (WTO). Observers: European Commission (EC), and United States International Trade Commission (USITC), United States Department of Agriculture (USDA). UNCTAD and World Bank

international trade in goods, changing quantities traded, or prices or both." Classifications of NTMs are mostly based on legal international regulations mandated by the WTO and other organizations, scholars have additionally identified NTMs based on their nature and implications into two broad categories. One category includes quantitative NTMs such as anti-dumping (AD), quantitative restrictions (QR), safeguard measures (SG), etc. In spite of having quantitative implications, this broad category of NTMs can be also grounded on some qualitative nature (e.g. national legal bases, national security, health and environment issues, market adjustments, etc.). Second category refers to NTMs with qualitative nature and implications. TBT and SPS are usually indicated in the core NTM category, which are mostly restrictions for regulations and higher standards. Irrespective of complex motives behind such trade policy measures – i.e. following good faith and legitimate motives unlike discriminative motives – they are basically caused by technology, domestic standards and innovations, and qualitative, health, and environment issues (Ghodsi, 2015a). Therefore, core NTMs are considered to have also non-quantitative effects on trade flows rooting from production procedures and quality improvement.

Core NTMs can be aimed at improving the quality of the imported products in order to harmonize the domestic market standards. Standard-based regulations can potentially improve the production procedures or quality of products (Wilson and Otsuki, 2004; Trienekens and Zuurbier, 2008). Using imports unit-values as a proxy for quality of the imported products, Ghodsi (2015c) found evidences of diverse quality improvement of TBT Specific Trade Concerns (STC) imposed by the EU, USA, and China.

Impact of NTMs on trade flows has been studied in the literature. For instance, using a gravity model on traded HS 6-digit products, Essaji (2008) found that the technical regulations imposed by the US, incur a huge cost on poor exporting countries with lower capacities. Using the data on TBT notifications to the WTO, Bao and Qiu (2012) found that these regulations reduce the export extensive margins while increasing the intensive margins. In a Computable General Equilibrium (CGE) framework, Francois et al. (2011) analyzed trade liberalization gains of preferential trade agreements. They found that reduction in NTMs would have much larger impact than the reduction in tariffs. Disdier et al. (2010), Li and Beghin (2012), Yousefi and Liu (2013), and Ghodsi (2015c) have also found negative impact of core NTMs on trade flows.

This contribution extends the literature by having a special focus on the role of different NTM types on the quality of traded products. In addition to unit-value of traded products as a simple proxy for quality, the quality – measured by the recent frameworks in the literature (Hallak and Schott, 2008; Khandelwal, 2010; and Feenstra and Romalis, 2014) – will be used in our analysis. The rest of the chapter is structured as follows. In the next section, we summarize the model by Feenstra and Romalis (2014) which provides a framework to disentangle quantity, price, and quality effects of bilateral trade flows. Section 3 discusses data issues and the methodology; and in Section 4, the results of the gravity model are presented. Section 5 concludes.

jointly coordinate MAST. MAST reports to the Group of Eminent Persons, which is convened by the director general of UNCTAD.

3.2. Methodological framework

The starting point of the analysis is the model presented in Feenstra and Romalis (2014) – referred to as F&R (2014) – providing a framework to disentangle quantity, quality and price effects of exports and imports. Here the intuition of the model is presented allowing for a proper interpretation of results concerning the econometric outcomes of the effects of non-tariff measures (NTMs).[18]

The model starts from an expenditure function given by

$$E^k = U^k \left[\int_i \left(\frac{p_i^k}{\left(z_i^k\right)^{\alpha^k}} \right)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}} = U^k \left[\int_i \left(\frac{p_i^k}{z_i^k} \frac{1}{\left(z_i^k\right)^{\alpha^k - 1}} \right)^{1-\sigma} di \right]^{\frac{1}{1-\sigma}} \quad (3.1)$$

(with $\sigma > 1$) implying non-homothetic demand for quality for $\alpha^k(U^k) \geq 1$. The price p_i^k of good i sold in market k is divided by quality z_i^k which allows one to model the consumer decision in quality-adjusted prices and quantities. The quality-adjusted price is denoted by $P_i^k := p_i^k / z_i^{\alpha^k}$ where for brevity one sets $\left(z_i^k\right)^{\alpha^k} := z_i^{\alpha^k}$. Note that the quality-adjusted price depends on both the level of quality z_i^k and how consumers evaluate quality α^k. Both lead to lower quality–adjusted prices. Correspondingly, quality-adjusted demand is denoted by $Q_i^k := z_i^{\alpha^k} q_i^k$. The validity of the expenditure function is shown in F&R (2014). From above one can also see that quality-adjusted demand increases with quality.

At the firm side it is assumed that firms can produce multiple products (one for each market), and firm h in country r simultaneously choose quality z_{ih}^{rk} and the f.o.b. price $p_{ih}^{\text{fob},rk}$ to sell in market k. Further, the production function for quality z_{ih}^{rk} is assumed to be Cobb-Douglas given by productivity of labor φ_{ih}^{rk} and amount of labor l_{ih}^{rk} used: $z_{ih}^{rk} = \left(l_{ih}^{rk} \varphi_{ih}^{rk}\right)^{\theta}$ with $0 < \theta < 1$ reflecting diminishing returns to quality. The wage rate for (the composite) input l_{ih}^{rk} is given by w^r. Factor demand therefore is $l_{ih}^{rk} = \left(z_{ih}^{rk}\right)^{1/\theta} / \varphi_{ih}^{rk}$ and total per unit variable costs are $w^r l_{ih}^{rk} = w^r \left(z_{ih}^{rk}\right)^{1/\theta} / \varphi_{ih}^{rk}$. Further, firms pay fixed costs of exporting given by $f_{ih}^{rk}(\varphi_{ih}^{rk})$, i.e. depending on productivity. Productivity levels are assumed to be Pareto-distributed with $G_i^r(\varphi_i) = 1 - \left(\frac{\varphi_i}{\varphi_i^r}\right)^{-\gamma_i}$ where $\varphi_i < \varphi_i^r$ (φ_i is the lower bound of productivities in country r).[19]

Concerning trade costs, the assumption is that there are both specific (per unit) trade costs denoted by T_i^{rk} and ad valorem trade costs τ_i^{rk}. Tariffs might be included and considered similarly denoted by t_i^{rk}. Similarly other ad valorem costs (e.g. AVEs of NTMs) might be part

[18] The section summarises the model in F&R (2014) with some small changes in notation.

[19] The lower bound φ_i^r might vary across countries, though the dispersion parameter λ_i is assumed the same across countries.

of the specific trade costs or assumed to be tariff-equivalents. These trade costs are applied to the value including the specific trade costs giving the c.i.f. price (including tariffs) as [20]

$$p_{ih}^{\text{cif},rk} = \left(1 + t_i^{rk}\right)\left(1 + \tau_i^{rk}\right)\left(p_{ih}^{\text{fob},rk} + T_i^{rk}\right) \tag{3.2}$$

The marginal costs are the same as total costs for producing one unit of a good with quality z_{ih}^{rk}, i.e. $c_{ih}^{rk}\left(z_{ih}^{rk}, w^r\right) = w^r l_{ih}^{rk} = w^r (z_{ih}^{rk})^{1/\theta} / \varphi_{ih}^r$. These are thus increasing in the wage rate w^r and the quality z_i^{rk}, and decreasing in φ_{ih}^r. Firm maximization problem is thus given by

$$\max_{p_{ih}^{\text{fob},rk}, z_{ih}^{rk}} \left[p_{ih}^{\text{fob},rk} - w^r (z_{ih}^{rk})^{1/\theta} / \varphi_i^r\right] \frac{(1 + \tau_i^{rk}) q_{ih}^{rk}}{(1 + t_i^{rk})}$$

This can be reformulated in quality-adjusted terms and to tariff-exclusive c.i.f. prices which can be rewritten in quality-adjusted c.i.f. prices net of tariffs (see Appendix)

$$\max_{P_i^{\text{cif},rk}, z_i^{rk}} \left[P_{ih}^{\text{cif},rk} - (1 + \tau_i^{rk}) \frac{\left(\frac{w^r \left(z_{ih}^{rk}\right)^{\frac{1}{\theta}}}{\varphi_{ij}^r} + T_i^{rk} \right)}{\left(z_{ih}^{rk}\right)^{\alpha_k}} \right] \frac{Q_{ih}^{rk}}{(1 + t_i^{rk})} \tag{3.3}$$

The assumption of the Cobb-Douglas production function and the resulting cost function give in a log-linear form of the optimal quality choice (see F&R (2014) for the derivation)

$$z_{ih}^{rk} = \left(T_i^{rk} \frac{\alpha^k \theta}{1 - \alpha^k \theta} \frac{}{w^r / \varphi_{ih}^r} \right)^{\theta}$$

Thus, quality is increasing with higher specific trade costs (Washington apples effect), higher productivity and higher parameter values $\alpha^k \theta$ [21]. If α^k is increasing with income, richer countries import higher qualities. If θ (depending on the exporter r) is larger, the returns to quality diminish less quickly and thus quality is increasing. Oppositely, quality is decreasing with higher wages, i.e. higher costs of production.

The marginal costs become proportional to the specific trade costs

$$c_{ih}^{rk}\left(z_{ih}^{rk}, w^r\right) = \left[\frac{\alpha^k \theta}{1 - \alpha^k \theta}\right] T_i^{rk} \tag{3.4}$$

These are increasing in α^k (as quality increases and therefore marginal costs increase) and the specific trade costs.

[20] The c.i.f. price exclusive of tariffs would then be $p_i^{\text{cif},rk} / (1 + t_i^{rk}) = (1 + \tau^{rk})\left(p_i^{\text{fob},rk} + T_i^{rk}\right)$.

[21] It is assumed that $0 < \alpha^k \theta < 1$.

The assumption of the CES expenditure function and the optimal choice of the f.o.b. price yield the familiar mark-up equation

$$\left(p_{ij}^{\text{fob},r\,k} + T_i^{rk}\right) = \left[c_{ih}^{rk}\left(z_{ih}^{rk}, w^r\right) + T_i^{rk}\right]\left(\frac{\sigma}{\sigma-1}\right)$$

Using the proportionality of marginal costs and specific trade costs gives f.o.b. and c.i.f. (inclusive tariffs) prices:

$$\begin{aligned} p_{ih}^{\text{fob},rk} &= T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right] =: \overline{p_i^{\text{fob},rk}} \\ p_{ih}^{\text{cif},rk} &= \left(1+t_i^{rk}\right)\left(1+\tau_i^{rk}\right)T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)\right] =: \overline{p_i^{\text{cif},rk}} \end{aligned} \tag{3.5}$$

Thus, the prices do not depend on firm productivity as more efficient firms sell higher quality products.[22] Thus, all firms selling to market k charge the same price, but only differ with respect to quality.

Finally it can be shown that quality is related to the log f.o.b. price

$$z_{ih}^{rk} = \left(\frac{\kappa_1^k \overline{p_i^{\text{fob},rk}}}{w^r/\varphi_{ih}^r}\right)^{\theta} = \left(\frac{\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right]}{w^r/\varphi_{ih}^r}\right)^{\theta} \tag{3.6}$$

with $\kappa_1^k = \frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}$. Thus, quality is increasing with the specific trade costs and productivity.

Let $\hat{\varphi}_i^{rk}$ denote the cutoff-productivity of the marginal exporter (i.e. the firm just covering the fixed costs of exporting). The c.i.f. (including tariffs) quality-adjusted price for the marginal exporter is defined as $\hat{P}_i^{\text{cif},rk} := \frac{p_i^{\text{cif},rk}}{\left(z_i^{rk}(\hat{\varphi}_i^{rk})\right)^{\alpha^k}}$ which after inserting yields

$$\hat{P}_i^{\text{cif},rk} = \frac{p_i^{\text{cif},rk}}{\left(z_i^{rk}(\hat{\varphi}_i^{rk})\right)^{\alpha^k}} = \frac{p_i^{\text{cif},rk}}{\left(\left(\frac{\kappa_1^k \overline{p_i^{\text{fob},rk}}}{w^r/\hat{\varphi}_i^{rk}}\right)^{\theta}\right)^{\alpha^k}} = p_i^{\text{cif},rk}\left(\frac{w^r/\hat{\varphi}_i^r}{\kappa_1^k \overline{p_i^{\text{fob},rk}}}\right)^{\alpha^k\theta}$$

which includes tariffs. $\hat{X}_i^{rk} = \hat{P}_i^{\text{cif},rk}\hat{Q}_i^{rk}$ is the (tariff-inclusive) export revenue. Firm profits are given by

$$\frac{\hat{X}_i^{rk}}{(1+t_i^{rk})}\frac{1}{\sigma} = f_i^{rk}(\hat{\varphi}_i^{rk}) \tag{3.7}$$

[22] As F&R (2014) describe, this is a razor-edge case.

which covers fixed costs. Assuming a special function for fixed costs as argued in F&R (2014)

$$f_i^{rk}\left(\hat{\varphi}_i^{rk}\right) = \left(\frac{w^r}{\hat{\varphi}_i^{rk}}\right)\left(\frac{Y^k}{p^k}\right)^{\beta_0} \exp(\beta' F_i^{rk})$$

(with $\beta_0 > 0$) allows one to derive the quality-adjusted c.i.f. price (tariff-inclusive) (under the assumption of homogenous firms)

$$\hat{P}_i^{\text{cif},rk} = \left[\frac{\overline{p_i^{\text{cif},rk}}}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\overline{p_i^{\text{fob},rk}}\right)^{\alpha^\kappa\theta}}\right]\left[\frac{X_i^{rk}}{\sigma(1+t_i^{rk})N_i^r}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk})\right]^{\alpha^\kappa\theta} \tag{3.8}$$

which after some manipulations (see Appendix) can be written as

$$\hat{P}_i^{\text{cif},rk} = \left[\frac{(1+t_i^{rk})^{1-\alpha^\kappa\theta}(1+\tau_i^{rk})\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)\right](T_i^{rk})^{1-\alpha^\kappa\theta}}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right]\right)^{\alpha^\kappa\theta}}\right]\left[\frac{X_i^{rk}}{\sigma N_i^r}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk})\right]^{\alpha^\kappa\theta} \tag{3.9}$$

The quality-adjusted price is decreasing with κ_1^k (which is increasing in its arguments), a larger f.o.b. price and increasing with a larger c.i.f. price. In the second term it is decreasing with tariffs σ, and the number of exporters. It is further decreasing with the size of the market and the fix costs. The value of exports X_i^{rk} and the quality-adjusted price $\hat{P}_i^{\text{cif},rk}$ are positively related – contrary to the demand side interpretation. A similar equation holds in the case of heterogeneous firms (see Appendix)

From the CES demand it would follow that

$$\hat{X}_i^{rk} = \frac{X_i^{rk}}{N_i^r} = \left(\frac{\hat{P}_i^{\text{cif},rk}}{P^k}\right)^{-(\sigma-1)} Y^k$$

i.e. a higher quality-adjusted price results in lower export values. Using supply side information results in an export equation which is close to a gravity equation.

$$\frac{X_i^{rk}}{M_i^r(\frac{\varphi_i^r}{w^r})^\gamma} = \left(\frac{\overline{P_i^{\text{cif},rk}}}{P^k}\right)^{-(\sigma-1)(1+\gamma)} (Y^k)^{1+\gamma}\left(\sigma\kappa_2^k\left(1+t_i^{rk}\right)\left(\frac{Y^k}{p^k}\right)^{\beta_o}\exp\left(\beta' F_i^k\right)\right)^{-\gamma} \tag{3.10}$$

F&R (2014) used equation (3.10) for two representative countries i and j exporting to market k, which could be equivalently used for two different markets k and l as destinations of export for a representative country i. Therefore, equation (3.10) is modified to be estimated using GMM to calculate the unknown parameters of the model. For simplicity, preference parameter for quality of the USA is assumed to be equal to 1, and other countries' preferences are then calculated relative to the US with iterated estimations. The quality framework presented above considers both demand and supply sides of the markets, which improves the former frameworks

proposed by Hallak and Schott (2008) and Khandelwal (2010). The following analysis is based on the quality of traded products measured by the discussed framework above.

3.3. Data and specification

The analysis is conducted for a sample of countries during 1995-2011. The sample includes all WTO members as importing countries, mainly because the NTM database includes the notifications of the WTO members against the imports of all other countries in the world. Moreover, due to harmonization of trade policy measures, regulations, and standards within the European Union, all intra-EU trade flows are excluded from the sample of analysis. The primary data source is the results derived in F&R (2014) which are downloadable from the website.[23] These data provide information for each four-digit SITC Rev. 2 good (about 712 products) for all bilateral trade flows between country pairs over the period 1984-2011. These data – which have undergone a data cleaning process - include exports in f.o.b. and imports in c.i.f. prices in values, bilateral flows in quantity terms, and unit values. Based on the theoretical framework outlined in F&R (2014) discussed above, GMM estimations are performed for each of the 712 products to estimate the relevant elasticities with other parameters partly taken from the literature. Using these indexes, quality, quality-adjusted prices, and quality-adjusted quantities traded are derived. Thus, the dataset includes the following eleven variables for bilateral trade relations:

- Traded values:
    - Value of trade for exports (v_fob)
    - Value of trade for imports (v_cif)
- Traded quantities (Q)
- Unit values
    - Unit values for exports (uv_fob)
    - Unit values for imports (uv_cif)
- Quality
    - Quality of exports (q_fob)
    - Quality of imports (q_cif)
- Quality-adjusted prices
    - Quality-adjusted export prices (qa_p_fob)
    - Quality adjusted import prices (qa_p_cif)
- Quality-adjusted quantities
    - Quality-adjusted export quantities (qa_Q_fob)
    - Quality-adjusted import quantities (qa_Q_cif)

According to the theoretical settings, these variables are closely linked to each other: For example, the value of exports equals the traded quantity times the export unit values, and the

[23] See http://www.robertfeenstra.info/data/

export unit values equal the export quality times the quality-adjusted export prices. Similarly, quality-adjusted export quantities divided by the quality of exports equals the quantity of exports. Analogously, this holds for the imports.

In the econometric part, we estimate these bilateral trade variables in a simple gravity model that is given by:

$$\begin{aligned} \ln x_t^{jks} = \; & \alpha_0 + \boldsymbol{\alpha}_1' \ln \mathbf{F}_t^j + \boldsymbol{\alpha}_2' \ln \mathbf{F}_t^k + \boldsymbol{\alpha}_3' \mathbf{Gravity}^{jk} \\ & + \boldsymbol{\alpha}_4' \ln \mathbf{TP}_t^{jks} + \boldsymbol{\alpha}_5' \text{Dummies} + \epsilon^t + \epsilon^s + \epsilon^j + \epsilon^k + \varepsilon_t^{jks} \end{aligned} \tag{3.11}$$

where $\ln x_t^{jks}$ denotes one of the eleven variables mentioned above in natural logarithm. For instance, $v\_fob_t^{jks}$ indicates logarithm of export values (f.o.b. trade) of sector *s* from country *j* to country *k* at time *t*. Explanatory variables included in vector F_t are exporter and importer characteristics like population and GDP per capita, Distances in factor endowments (i.e. capital and land); variables included in *Gravity* are geographic distance, contiguity, common language, same country, and colony. Dummies included are for WTO membership and for preferential trade agreement PTAs. A set of trade policy variables is included in TP_t. These variables are tariffs and measures of NTMs described below. Finally, ϵ refers to fixed effect dummies that are time, sector, exporter, and importer specific; and ε_t^{jks} is the error term.

The data from explanatory variables are collected from various sources. Concerning trade policy measures both variables for tariff and non-tariff measures are included. The data on tariffs are again taken from the F&R (2014) which includes preferential rates and MFN wherever applicable.

With respect to non-tariff measures, six different types of NTMs are included: (i) Technical Barriers to Trade (TBT) and (ii) Sanitary and Phytosanitary Measures (SPS) are included which can allow countries to impose restrictions on the imports of low-quality products suspected to harm domestic consumers' health, environment, etc. It is expected that these core NTMs induce higher standards in the import market, in addition to improving the market efficiency by information requirements such as mandatory labelling. TBT and SPS measures are usually imposed against the imports from all other countries in the world. In addition, WTO allows countries to consult other members' regulations within the minutes recording. This provides a reverse notification system to raise Specific Trade Concerns (STC) on these regulations. Therefore, TBT STCs and SPS STCs are raised by partners facing TBT and SPS measures. STCs are specific cases of TBT and SPS having specific trade disturbances. Some of STCs can be found in the direct notifications on TBT and SPS, therefore they have overlaps with the set of TBT and SPS. However, there are many STC notifications that are not notified by the imposing members directly to the WTO. Hence, we include (iii) TBT STCs and (iv) SPS STCs in addition to the direct notifications.

In the specification also other measures are investigated, notably (v) anti-dumping measures (ADP) and (vi) a set of other quantitative restrictions including safeguard measures (SG), special safeguards (SSG), countervailing duties (CV) and quantitative restrictions (QR). These

are combined into one group labelled QNTM. All these NTMs are count variables indicating the number of a given type of NTM imposed (going in force) at time *t* on sector *s* by the importer country *k* against trade partner *j*. Whether the NTM is still in force in the next period is not considered in the analysis, since there is no evident information regarding their withdrawal. Hence, NTMs are counts or hits of measures at the time of imposition. The data on NTMs are collected from the WTO I-TIP database which are compiled and harmonized and matched to the trade data (see Ghodsi et al., 2015, for details). Table 3.1 shows the summary statistics on different NTM types used in the analysis. TBT is the most important NTM covering 2.23 Million affected products with 36069 billion USD (28.95% of all imports) during the period. Next major NTM is STCs affecting 1.08 Million 4-digit SITC products with 21858 billion USD value (17.55% of all imports). TBT STC, QNTM, ADP, and SPS STCs are the next NTMs in terms of traded values in the world.

Table 3.1 – Statistics on imposed NTM Types - Period 1995-2011

SITC	NTM	Products	Product %	Imports Bil. $	Import%	NTM	Products	Product%	Imports Bil. $	Import%
0		1573	7.8%	42.9238	0.64%		14446	12.6%	194.8425	2.90%
1		73	0.4%	0.174563	0.02%		1719	1.5%	42.41775	4.19%
2		380	1.9%	11.27397	0.20%		4320	3.8%	73.33449	1.29%
3		91	0.5%	2.921905	0.02%		954	0.8%	196.5416	1.24%
4		369	1.8%	3.825225	0.59%		754	0.7%	4.487601	0.69%
5	**ADP**	5718	28.3%	178.3092	1.65%	**QNTM**	33479	29.2%	298.1974	2.76%
6		6499	32.2%	185.516	1.09%		16288	14.2%	148.0525	0.87%
7		3345	16.6%	229.9319	0.46%		26917	23.5%	508.9229	1.03%
8		2146	10.6%	166.2538	1.05%		15300	13.3%	167.7766	1.06%
9		5	0.0%	0.000454	0.00%		486	0.4%	1.862533	0.13%
All		**20199**	**100.0%**	**821.1309**	**0.66%**		**114663**	**100.0%**	**1636.436**	**1.31%**
0		393908	17.6%	2941.978	43.80%		415637	38.2%	3470.792	51.67%
1		45483	2.0%	405.8401	40.12%		33670	3.1%	391.3468	38.69%
2		80089	3.6%	864.9362	15.20%		76887	7.1%	932.6742	16.39%
3		14295	0.6%	2233.979	14.09%		7049	0.6%	1958.501	12.35%
4		33688	1.5%	238.0025	36.85%		35426	3.3%	265.9301	41.17%
5	**TBT**	413113	18.5%	4865.054	45.04%	**SPS**	246505	22.7%	3742.776	34.65%
6		301307	13.5%	2120.758	12.44%		83625	7.7%	1677.85	9.84%
7		599567	26.8%	17401.9	35.12%		85004	7.8%	6553.895	13.23%
8		346589	15.5%	4911.849	31.13%		97999	9.0%	2795.494	17.72%
9		7040	0.3%	85.59396	5.77%		6017	0.6%	69.22874	4.67%
All		**2235079**	**100.0%**	**36069.9**	**28.95%**		**1087819**	**100.0%**	**21858.49**	**17.55%**
0		8637	13.8%	99.48851	1.48%		8018	55.0%	103.8406	1.55%
1		1215	1.9%	21.94421	2.17%		543	3.7%	6.409045	0.63%
2		1870	3.0%	27.76536	0.49%		1485	10.2%	16.23904	0.29%
3		415	0.7%	9.956304	0.06%		50	0.3%	0.219222	0.00%
4		985	1.6%	4.206423	0.65%		466	3.2%	1.223548	0.19%
5	**TBTSTC**	12315	19.7%	217.489	2.01%	**SPSSTC**	2297	15.8%	34.92761	0.32%
6		7313	11.7%	64.75047	0.38%		1330	9.1%	9.957546	0.06%
7		21411	34.3%	979.2562	1.98%		4	0.0%	0.158932	0.00%
8		8052	12.9%	316.1557	2.00%		289	2.0%	2.487154	0.02%
9		153	0.2%	0.673333	0.05%		100	0.7%	0.112106	0.01%
All		**62366**	**100.0%**	**1741.686**	**1.40%**		**14582**	**100.0%**	**175.5748**	**0.14%**

In the regressions, two other variables are included capturing WTO membership (i.e. a dummy set to 1 if both countries are WTO members), and a dummy for membership in preferential trade agreements (PTAs). PTA data are collected from WTO website. It is expected that partners with WTO membership and PTA have better trade relationship.

Further variables included are indicators of similarity of countries with respect to GDP per capita, indicators of relative capital and land to real GDP of both partners[24], and the total population of both partners capturing market potential taken from the Penn World Tables (Feenstra et al., 2013, and 2015; PWT 8.1[25]), and the World Development Indicators (WDI). Similarities in two relative factors of production are measured as follows:

$$factor_{fjkt} = \left| ln\left(\frac{F_{fjt}}{GDP_{jt}}\right) - ln\left(\frac{F_{fkt}}{GDP_{kt}}\right) \right|, F_f \in \{K, A_l\}$$

where K and A_l refer to capital stock and agricultural land area of the country (j or k) respectively. When the two countries are very similar in relative endowments, this index goes to zero, and it increases as the countries diverge.

Further, a set of the usual gravity variables taken from CEPII are included: geographic distance, common language, contiguity, colonial ties and a variable for being in the same country (smctry).

All variables except dummies are included in logs in the regressions. The above equation is estimated with simple OLS. Robust estimator clustering product-country-pair is used to control for the diverse bilateral-product shocks causing heteroskedasticitic error term. Due to the multiplicative – or log-linear – relationship between these eleven variables the estimated coefficients of each explanatory variable on the respective trade measure can be summed up providing an overall measure of the relative importance of quantity effects, quality effects and quality-adjusted price effects.

3.4. Results

In this section, we present the results of this exercise. First, we start with the overall results, i.e. including all products in the regressions. In the second subsection, we present results for individual SITC groups.

3.4.1. The whole sample

The results for the whole sample are presented in Table 3.2. Overall, the regressions perform quite well through the R-squared for the values of exports and imports are relatively low. These are higher for the unit values, the quality indicator and the quality-adjusted prices and quantities.

For an overview of results, we opt for a graphical presentation. Note that the respective dependent variables are multiplicative or log-linear, thus the estimated coefficients can be summed up to give the relative importance of the dimensions quantities, quality and quality-adjusted prices.

[24] Since population of both countries are included in the regressions, relative similarities in labor force is not included

[25] Can be found at: http://www.rug.nl/research/ggdc/data/pwt/

Figure 3-1 presents the cumulated effect of the import flows. The regressions are run on both the export data (in f.o.b. prices) and import data (in c.i.f. prices). Not surprisingly, the overall results of the gravity models on traded values are very similar as the difference is only the c.i.f./f.o.b. margins.[26] The coefficients are graphically represented in Figure 3-1 and Figure 3-2.[27]

As mentioned above, the coefficients on the various variables can be summed up and in these figures, therefore the overall effect of the respective variable on the trade flows in nominal terms (the blue diamond), the quantity effect, the quality effect, and the effect on the quality-adjusted price index are presented. By theoretical construction, import value equals quantity multiplied by unit values; hence, the summation of coefficient on the log of unit-value and the log of traded quantity can be equal to the coefficient on the log of import value. Moreover, the summation of coefficient on the log of imported quality and the log of quality-adjusted import price should be equal to the coefficient on the log of import unit-value. However, the coefficient on the log of traded quantity is equal to the coefficient on the log of import quality deducted from the quality-adjusted quantity.

For all variables, the quantity effect dominates which can be better seen in Figure 3 reporting the relative effects in percent of the overall effect. However, some other interesting points can be found in Table 3.2 as follows.

Countries with larger population have larger traded quantities, but lower traded quality and prices. This might refer to the economies of scale in the destination market, in which larger quantities and qualities demanded are relevantly cheaper. Therefore, the overall effect of population on the trade values is statistically insignificant.

A larger GDP per capita of the trading partners implies a higher quality of trade with a negligible effect on the quality-adjusted price. This is in line with the formulations of the theoretical framework, which indicates higher preferences for quality in advanced economies and higher quality of produced commodities in advanced economies. Besides, countries with higher GDP per capita, export larger quantities.

Negative coefficients of endowment factors dissimilarities indicated that similar countries in terms of relative endowments have larger trade with each other, either in nominal terms or in quantities. However, the less the countries are similar in factors of production, the higher are the price and quality of their bilateral trade, and the lower are the quality-adjusted quantities traded.

While tariffs have hampering effects on trade, they increase the quality and quality-adjusted quantity of exports. This lies in the construction of the theoretical framework (i.e. equation (3.7)), the quality-adjusted export revenue is positively affected by tariffs and fixed cost of exports. Hence, quality and quality-adjusted quantity should increase by tariffs.

Washington apple effect: Distance means less quantity, but higher quality and higher quality-adjusted (c.i.f.) price. This is also in line with the formulation of the theoretical framework,

[26] Larger differences in coefficients occur only for tariffs which we will investigate in the next step.
[27] In these graphs we calculated the GDP effect from the coefficients on population and GDP per capita.

which suggests that in order to export to distant destinations, exporting firms should produce with higher qualities to maintain the quality at the destination.

Having PTA between bilateral partners, both being a member of the WTO, having the same border, ethnical languages and colonial heritage have almost similar impact on all dependent variables. In other words, these factors improve trade by decreasing the transaction costs. However, countries with such relationships trade products with lower quality. Moreover, when both trading partners are WTO members, the quality-adjusted price of their bilateral trade is higher, which might refer to higher costs of production.

In contrast, trade between same countries is more costly and with higher quality. In fact, same countries such as Hong Kong, Thailand, and China have higher bilateral trade flows, with higher products quality and higher prices.

With respect to the trade policy variables, one finds that tariffs have a strong negative quantity effect, with only a very limited role for quality-adjusted prices and quality of imports. Both these variables have a negative effect of about 10% of the overall effect of tariffs on import flows (Figure 3-3). This large quantity effect relative to price and quality effect is similarly the case for SPS, which however shows a – tiny – positive effect on the imports unit-values, traded quality, and quality-adjusted price of export. The results in Table 3.2 suggest that SPS imposition has positive impact on the quality of imports rather than the prices related to production of quantities (i.e. quality-adjusted price). However, quality-adjusted import quantity is negatively affected by SPS, which indicates a lower demand induced by the measure. Overall, a hampering effect on trade values is observed. Export quality is also improved by the measure, showing the impact of measure on the production in the country of origin. This quality improvement is accompanied with a lower quality-adjusted price and higher export unit-values, which are not statistically significant. However, SPS STCs have opposite impact on the quality of products. These bilateral measures are decreasing the quality of traded products and unit-values inducing larger traded quantities. In spite of raising concerns on the SPS measures, these specific regulations enhance trade through lower prices.

For TBTs, one finds a trade enhancing impact for which about 36% is due to an increase in quantities traded, 25% due to an increase in the import quality-adjusted prices and the remaining 38% due to an increase in the import quality. Export values are increased by TBTs through 6% increase in quality-adjusted export price and 60% improvement in quality of exports. This considerably indicates the positive impact of TBTs on the production quality in the country of origin. However, trade-improving impact of TBT STCs is largely contributed to both higher quantity and higher prices net of quality. In fact, while quality of export is not affected by these STCs, quality of imports is downgraded statistically significantly.

The NTMs collected in the category QNTM have a negative impact on quantities and quality adjusted-price of imports. However, while traded quality is improved by these measures, the overall impact on trade shows the prohibitive behavior of these quantitative measures.

The impact of ADP is surprisingly trade enhancing. The results suggest that traded values and quantities are strongly higher for the bilateral flows in which there are more anti-dumping cases.

Moreover, both unit values and quality of trade products are lower for the bilateral product flows in which there are more ADP notifications. However, quality-adjusted import price and quality-adjusted traded quantities are increasing by ADP cases. ADP is imposed to counter dumping.

Table 3.2 – Results from gravity estimation including all products, OLS with Fixed Effects

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	0.029*	0.013	0.073***	-0.044***	-0.060***	-0.023***	-0.040***	-0.021***	-0.0037**	0.049***	0.017
	(0.011)	(0.011)	(0.013)	(0.0063)	(0.0063)	(0.0040)	(0.0055)	(0.0029)	(0.0011)	(0.011)	(0.011)
Population $_k$	0.011	-0.0067	0.33***	-0.32***	-0.34***	-0.25***	-0.30***	-0.076***	-0.024***	0.087***	0.017
	(0.018)	(0.018)	(0.021)	(0.0093)	(0.0093)	(0.0060)	(0.0082)	(0.0043)	(0.0017)	(0.018)	(0.018)
GDP pc $_j$	0.086***	0.10***	0.0074	0.078***	0.094***	0.077***	0.078***	0.0014	0.00028	0.084***	0.10***
	(0.0073)	(0.0073)	(0.0085)	(0.0040)	(0.0040)	(0.0026)	(0.0035)	(0.0019)	(0.00073)	(0.0072)	(0.0073)
GDP pc $_k$	0.43***	0.43***	0.35***	0.078***	0.075***	-0.012***	0.047***	0.090***	0.031***	0.34***	0.40***
	(0.0084)	(0.0084)	(0.0097)	(0.0045)	(0.0045)	(0.0029)	(0.0040)	(0.0021)	(0.00082)	(0.0082)	(0.0084)
Factor $_K$	-0.089***	-0.086***	-0.12***	0.027***	0.030***	0.023***	0.024***	0.0036***	0.0022***	-0.093***	-0.088***
	(0.0029)	(0.0029)	(0.0034)	(0.0016)	(0.0016)	(0.0010)	(0.0014)	(0.00071)	(0.00028)	(0.0029)	(0.0029)
Factor $_{Al}$	-0.056***	-0.059***	-0.087***	0.031***	0.029***	0.033***	0.033***	-0.0020	-0.0014*	-0.054***	-0.057***
	(0.0065)	(0.0065)	(0.0075)	(0.0035)	(0.0036)	(0.0023)	(0.0031)	(0.0017)	(0.00064)	(0.0063)	(0.0065)
Tariff	-0.70***	-0.71***	-0.63***	-0.067***	-0.075***	-0.028***	0.82***	-0.039***	-0.89***	-0.66***	0.18***
	(0.015)	(0.015)	(0.017)	(0.0060)	(0.0061)	(0.0039)	(0.0054)	(0.0027)	(0.0011)	(0.014)	(0.015)
Distance	-0.39***	-0.40***	-0.49***	0.096***	0.084***	0.077***	0.088***	0.019***	0.0087***	-0.41***	-0.41***
	(0.0023)	(0.0023)	(0.0026)	(0.00097)	(0.00097)	(0.00066)	(0.00087)	(0.00042)	(0.00016)	(0.0022)	(0.0023)
PTA	0.12***	0.12***	0.15***	-0.034***	-0.035***	-0.030***	-0.031***	-0.0045***	-0.0033***	0.12***	0.12***
	(0.0030)	(0.0030)	(0.0034)	(0.0013)	(0.0013)	(0.00091)	(0.0012)	(0.00058)	(0.00022)	(0.0030)	(0.0030)
WTO	0.20***	0.20***	0.20***	-0.0073***	-0.0083***	-0.020***	-0.0095***	0.013***	0.0021***	0.18***	0.19***
	(0.0033)	(0.0033)	(0.0038)	(0.0017)	(0.0017)	(0.0011)	(0.0015)	(0.00077)	(0.00030)	(0.0033)	(0.0033)
Contiguity	0.34***	0.35***	0.39***	-0.044***	-0.041***	-0.052***	-0.042***	0.0080***	-0.0022***	0.34***	0.35***
	(0.0063)	(0.0063)	(0.0070)	(0.0025)	(0.0025)	(0.0017)	(0.0023)	(0.0011)	(0.00040)	(0.0061)	(0.0063)
Com. lang.	0.11***	0.11***	0.13***	-0.017***	-0.017***	-0.018***	-0.016***	0.00049	-0.0015***	0.11***	0.11***
	(0.0043)	(0.0043)	(0.0048)	(0.0018)	(0.0018)	(0.0012)	(0.0016)	(0.00077)	(0.00028)	(0.0042)	(0.0043)
Colony	0.27***	0.27***	0.34***	-0.066***	-0.067***	-0.060***	-0.063***	-0.0059***	-0.0028***	0.28***	0.28***
	(0.0060)	(0.0060)	(0.0067)	(0.0025)	(0.0025)	(0.0017)	(0.0022)	(0.0011)	(0.00039)	(0.0058)	(0.0060)
Same Ctry	0.14***	0.15***	0.12***	0.028***	0.030***	0.0086***	0.021***	0.019***	0.0066***	0.12***	0.14***
	(0.0090)	(0.0091)	(0.010)	(0.0038)	(0.0038)	(0.0026)	(0.0034)	(0.0017)	(0.00063)	(0.0088)	(0.0090)
ADP	1.11***	1.12***	1.22***	-0.11***	-0.10***	-0.14***	-0.11***	0.027***	0.00036	1.09***	1.12***
	(0.022)	(0.022)	(0.025)	(0.0091)	(0.0091)	(0.0064)	(0.0081)	(0.0040)	(0.0016)	(0.021)	(0.022)
SPS	-0.056***	-0.057***	-0.059***	0.0031**	0.0018	0.0039***	0.0022*	-0.00080	0.00087***	-0.055***	-0.058***
	(0.0026)	(0.0026)	(0.0029)	(0.0010)	(0.0011)	(0.00072)	(0.00094)	(0.00045)	(0.00017)	(0.0026)	(0.0026)
TBT	0.026***	0.025***	0.0093***	0.017***	0.015***	0.010***	0.015***	0.0066***	0.0016***	0.019***	0.023***
	(0.0020)	(0.0020)	(0.0022)	(0.00084)	(0.00085)	(0.00057)	(0.00075)	(0.00037)	(0.00014)	(0.0019)	(0.0020)
TBTSTC	0.43***	0.44***	0.42***	0.012*	0.017***	-0.0096**	0.0062	0.021***	0.0057***	0.41***	0.43***
	(0.011)	(0.011)	(0.012)	(0.0050)	(0.0050)	(0.0033)	(0.0044)	(0.0022)	(0.00085)	(0.011)	(0.011)
SPSSTC	0.14***	0.12***	0.21***	-0.066***	-0.092***	-0.067***	-0.071***	0.0015	0.0048**	0.14***	0.11***
	(0.024)	(0.024)	(0.027)	(0.0099)	(0.0098)	(0.0067)	(0.0087)	(0.0045)	(0.0017)	(0.024)	(0.024)
QNTM	-0.024**	-0.027***	-0.032***	0.0079*	0.0043	0.011***	0.0079**	-0.0029*	0.000055	-0.021**	-0.027***
	(0.0080)	(0.0080)	(0.0090)	(0.0033)	(0.0034)	(0.0023)	(0.0030)	(0.0014)	(0.00055)	(0.0079)	(0.0081)
_cons	3.73***	3.74***	9.33***	-5.59***	-5.59***	-2.91***	-4.89***	-2.69***	-0.71***	6.42***	4.44***
	(0.11)	(0.11)	(0.12)	(0.047)	(0.048)	(0.032)	(0.042)	(0.021)	(0.0079)	(0.10)	(0.11)
N	13584744	13584744	13584744	13584744	13584744	13584744	13584744	13584744	13584744	13584744	13584744
R^2	0.282	0.286	0.679	0.900	0.898	0.892	0.901	0.903	0.908	0.487	0.323
adj. R^2	0.282	0.285	0.679	0.900	0.898	0.892	0.901	0.903	0.908	0.487	0.323

Standard errors in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 3-1 – Differentiated effects for import c.i.f. values

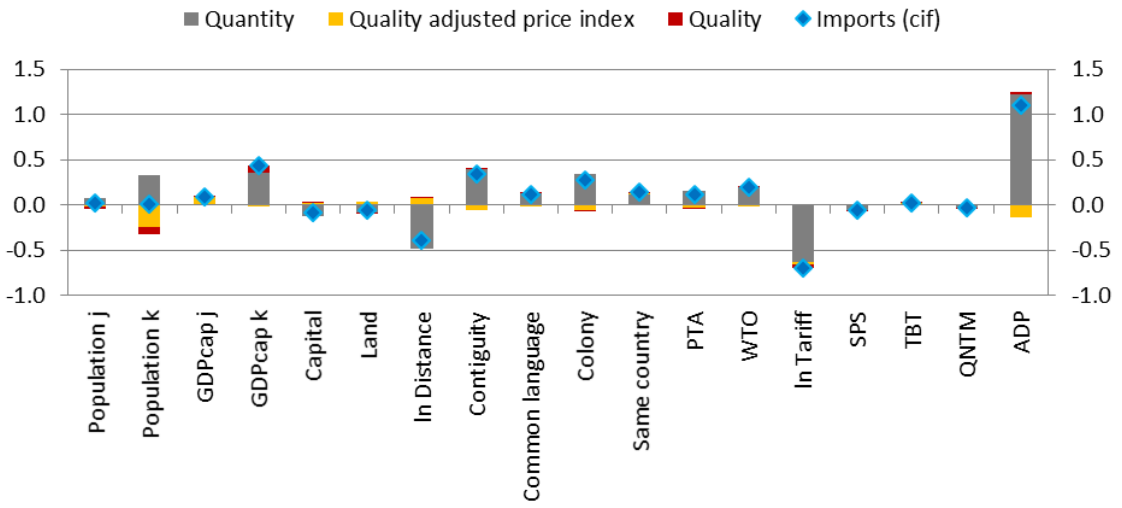


Figure 3-2 – Differentiated effects for export f.o.b. values

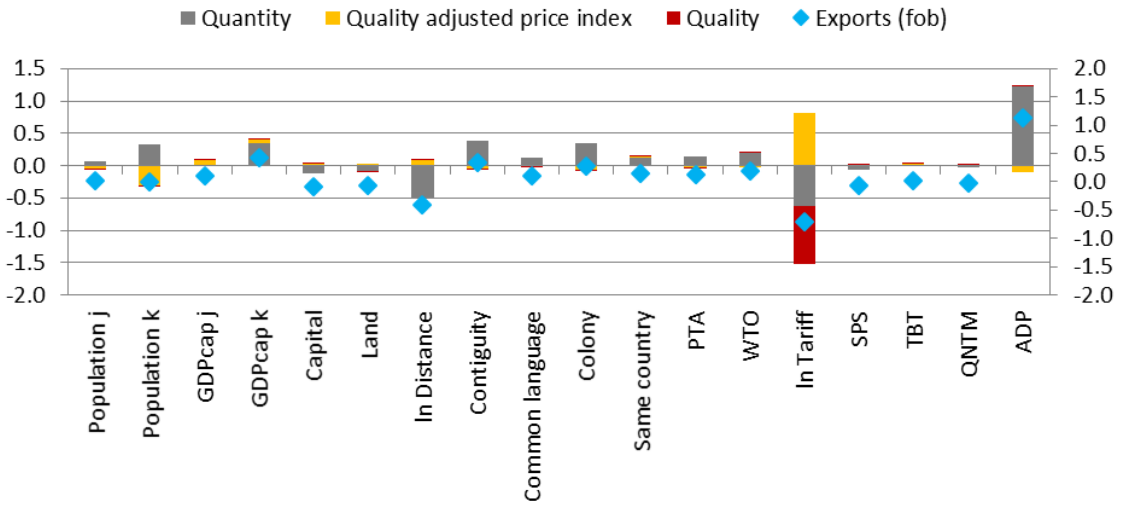
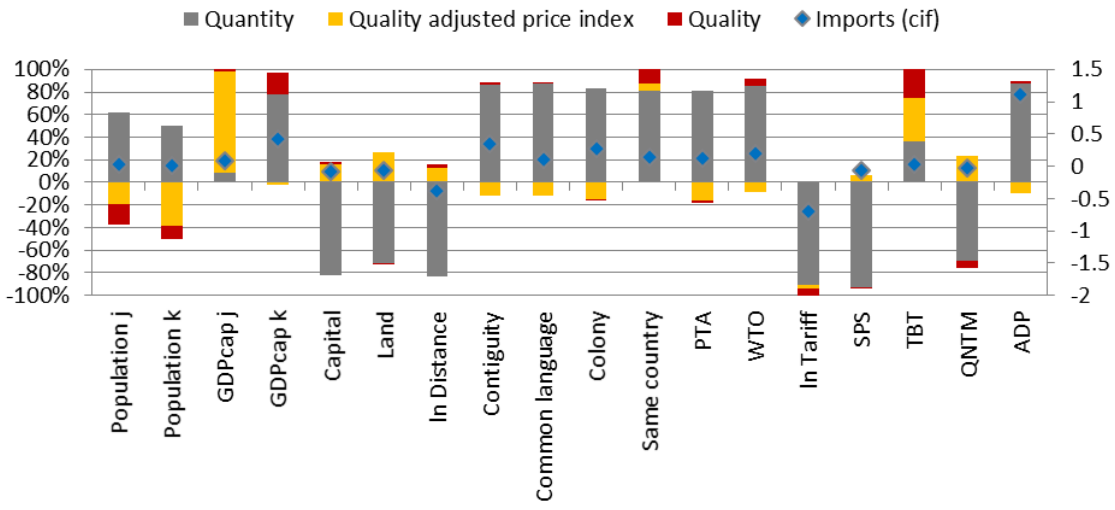


Figure 3-3 – Differentiated effects for import c.i.f. values – percentages in traded value effects



Export dumping usually occurs when the exporter reduces its price in the destination market to increase its market share. While this strategy is countered by an ADP, the exporter would rather provide goods with lower quality to make it more compliable with its previously low price in the market of destination. This might also be the case that ADP regulations damage the quality of the imported products. This strategy is reflected in lower traded unit-values whose quality contribution is much higher than the disturbed quality-adjusted price. The net effect of the ADP is reflected in higher quality-adjusted import price, which is much smaller in magnitude than the affected lower quality. However, no statistically significant impact of ADP on the quality-adjusted export price shows that the cost of production of each unit net of quality is not affected in the country of origin. Therefore, the lower quality contributing to lower prices would attract more demand resulting in higher quality-adjusted traded quantities and consequently higher import values. Overall, it can be stated that ADP has negative impact on the quality of traded products, and in general, it cannot be introduced as a suitable protectionist measure, while the exporters prefer to adjust their products quality at the border rather than adjusting their prices.

3.4.2. Differentiated effects by product groups

In separate estimations over aggregate SITC 1-digit categories[28], we analyze the impact of NTMs on trade. The estimation results on 10 categories of products are presented in appendix Table 3.3 through Table 3.12.

ADPs imposed on mineral fuels, lubricants and related materials improves their quality of exports statistically significantly. Quality of trade products in categories 1, 4, and 9 are not statistically influenced by the imposed ADPs. Quality of other products increases of with the ADP similar to the sample over all categories. Except for category 9 – which includes only three ADP notifications– ADP has a similar relationship with the dependent variables in all categories, wherever the coefficients are statistically significant. Hence, in general, the interpretation of ADP impact on dependent variables holds similar to the whole sample. In general, ADP induces exporters to downgrade the quality of products and increase their prices net of quality. The quality downgrade is larger than the price increase, which leads to higher demand of that specific product in a broad category of products. Overall, ADP affects the quality of traded products negatively.

QNTMs improve the quality of traded products within categories 5 and 7. While they do not influence trade values and quantities in these two categories of products, they simply increase unit-values through quality improvement and quality-adjusted prices. The number of QNTM notifications in these two categories is the largest across all categories (29% and 23% of all affected lines by QNTMs during the period are in category 5 and 7 respectively, with an average 1.27 notifications per line). The third and fourth categories with the largest number of QNTMs

[28] The categories are: 0 - Food and live animals; 1 - Beverages and tobacco; 2 - Crude materials, inedible, except fuels; 3 - Mineral fuels, lubricants and related materials; 4 - Animal and vegetable oils, fats and waxes; 5 - Chemicals and related products, n.e.s.; 6 - Manufactured goods classified chiefly by material; 7 - Machinery and transport equipment; 8 - Miscellaneous manufactured articles; 9 - Commodities and transactions not classified elsewhere in the SITC

in the sample are respectively Manufactured goods (SITC 6) and Miscellaneous manufactured articles (SITC 8) covering 14% and 13.2% of the affected lines by QNTMs respectively. The trade of these products is hampered by the QNTMs. In fact, quality, unit-values, and quantity of trade are decreased by these types of NTMs. Overall, QNTMs are observed to be restrictive obstacles on trade only for categories 2, 6, 8, and 9, in addition to the whole sample.

SPS enhances traded values and quantities mainly for Crude materials, inedible, except fuels (SITC 2). While these measures do not statistically influence the quality of products in this category, the quality-adjusted price and quality are increased. Trade values of products in categories 1, 4, 5, and 9 are not affected by the imposed SPS. Moreover, these regulations imped trade of products in categories 0, 3, 6, 7, and 8. Food and live animals (SITC 0) covers 38% of all affected lines by SPS during the period with average 4.9 number of notifications in each line. This category is considered the most predominant area at the focus of SPS, which is affected by significant quality improvement and price increase. However, a larger impeding effect on the traded quality-adjusted quantity leads to lower trade values. Chemicals and related products (SITC 5), is the second largest affected category covering 23% of all affected lines by SPS. However, it is observed that only quality-adjusted prices are affected statistically significantly by the SPS imposed on this category.

Machinery and transport equipment (SITC 7) with 33.9% of total world imports in 2011 covers 7.8% of all affected products by SPS. Safety issues can be accounted for as the most important issue within the measures of this product category. However, quality of the traded products in the seventh category is not statistically significantly affected by SPS. These regulations are impeding trade without any impact on quality of these products.

Results suggest that SPS measures have negative impact on quality of trade products within category of beverages and tobacco (SITC 1), and manufactured goods classified chiefly by material (SITC 6). 10.8% of affected products by SPS measures are included in these two categories. Overall, SPS notifications have diverse effects on the quality of traded products.

SPS STCs are affecting the quality of imports in categories 0, 5, and 2 negatively. These categories include the largest affected lines by TBT STCs (respectively 55%, 15.8%, and 10.2% of all affected lines). However, increased quality-adjusted quantity with these measures enhances the traded values of these products, while the unit-values of only food and live animals (SITC 0) are decreased statistically with these measures. In spite no significant impact on the quality of products in SITC 9 category SPS STCs are increasing the trade values. 466 lines in category 4 are affected by these notifications, which have higher trade values statistically. Nevertheless, we observe that import quality of Animal and vegetable oils, fats and waxes are improved by these measures at 5% level of significance.

TBTs are impeding import values and import quantities of Food and live animals (SITC 0), Beverages and tobacco (SITC 1), Mineral fuels, lubricants and related materials (SITC 3), and Machinery and transport equipment (SITC 7) products. SITCs 7, 0, 1, and 3 cover respectively 26.8%, 17.6%, 2%, and 0.6% of all affected products by TBT. We observe quality improvement of products by the imposition of TBT in these categories. Import quality and traded unit-values of Food and live animal products are not affected by TBTs. TBTs imposed on the seventh

category do not affect the quality-adjusted prices. This means that while there is a quality improvement by the regulations within the TBTs, the costs associated to the production of the quantities remain unchanged. This raises the traded unit-values leading to lower demanded quantity. The 14295 affected lines by the imposed TBTs in the third category of products enjoy higher quality and prices net of quality, which leads to lower quantity and values of traded products.

Traded values, quantities, unit-values, and quality of Chemicals and related products, n.e.s. (SITC 5), and miscellaneous manufactured articles (SITC 8) are improved by the imposed TBTs. 34% of affected products by TBT are in these two categories. Technical regulations within these trade policy instruments lead to higher quality of traded products. These products are often used as intermediates and inputs of productions. Therefore, intermediates with higher qualities complying with domestic standards can find higher demand, leading to higher import values.

Except for crude materials, inedible, except fuels (SITC 2), we observe higher quality of traded products where TBTs are imposed. By nature, TBTs are regulations affecting product qualities and production procedures. High standards regulated within these trade instruments improve the quality of imported products in general. Depending on the type of the product and its usage in the supply chains, the demand for the products and their imports will be affected as observed.

Except for food and live animals (SITC 0) whose trade values are not affected by TBT STC, and for Animal and vegetable oils, fats and waxes (SITC 4) whose traded values and quantities are impeded by these measures, TBT STCs are enhancing trade in other sectors. In SITC 1 category, traded quantity and quality-adjusted quantity is improved proportionally higher than the quality and price downgrading, leading to higher trade values by TBT STCs. Moreover, while quality of imports of SITC 7 is decreased with these regulations, all other products enjoy higher quality of traded products where the TBT STCs are notified. In spite of the concerns raised within these notifications, we observe trade enhancing, and quality improvement of TBT STC, which is in line with the results previously discussed in Ghodsi (2015c).

Figure 3-4 – Tariff impact on import of product categories

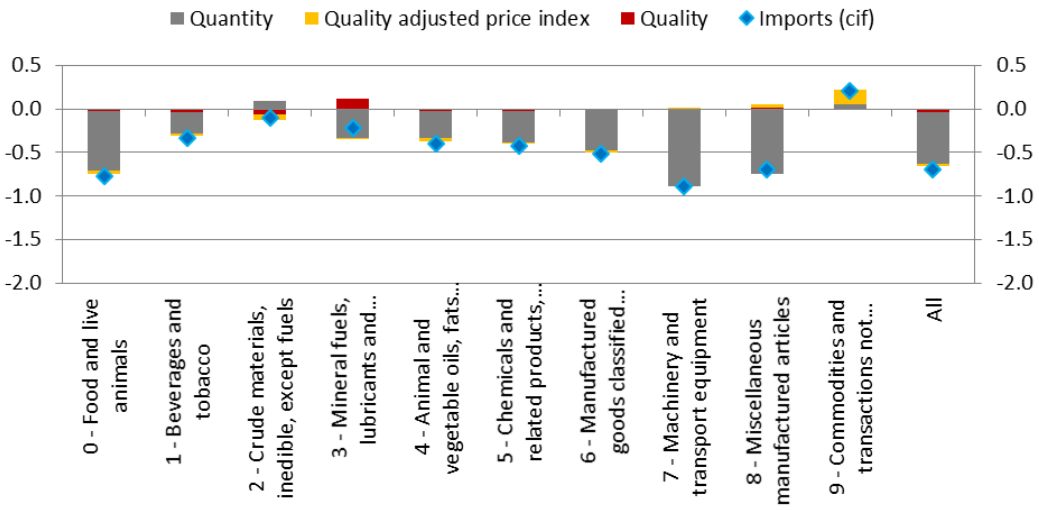


Figure 3-5 – SPS impact on import of product categories

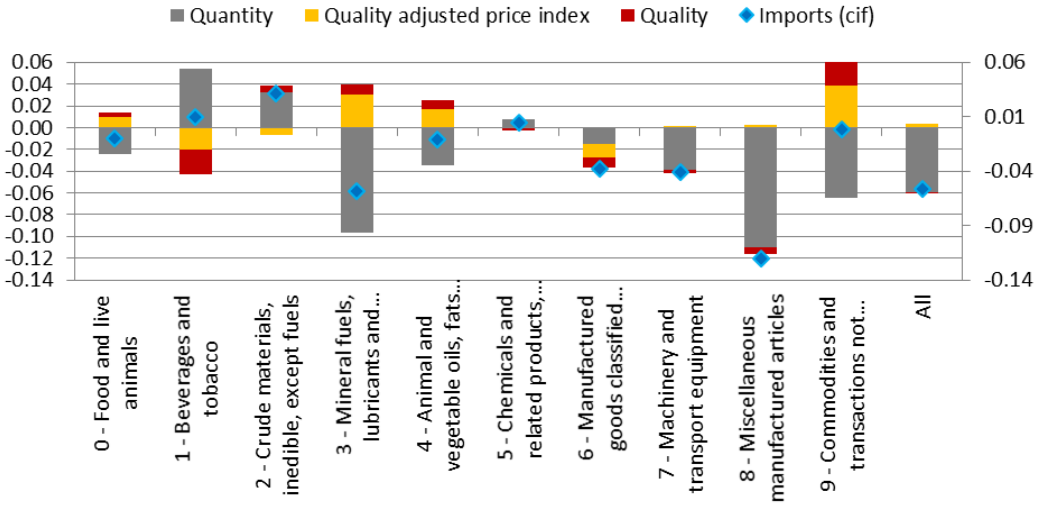


Figure 3-6 – TBT impact on import of product categories

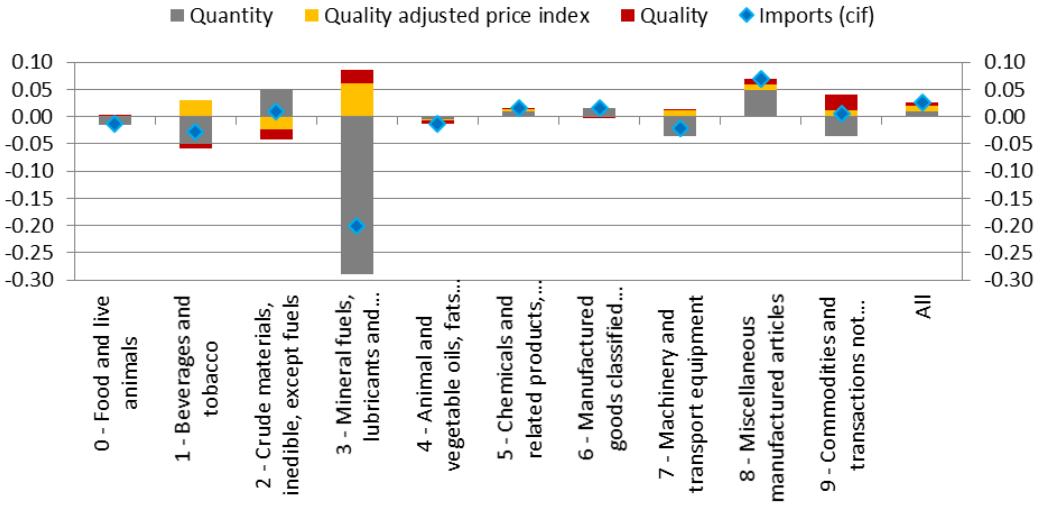


Figure 3-7 – ADP impact on import of product categories

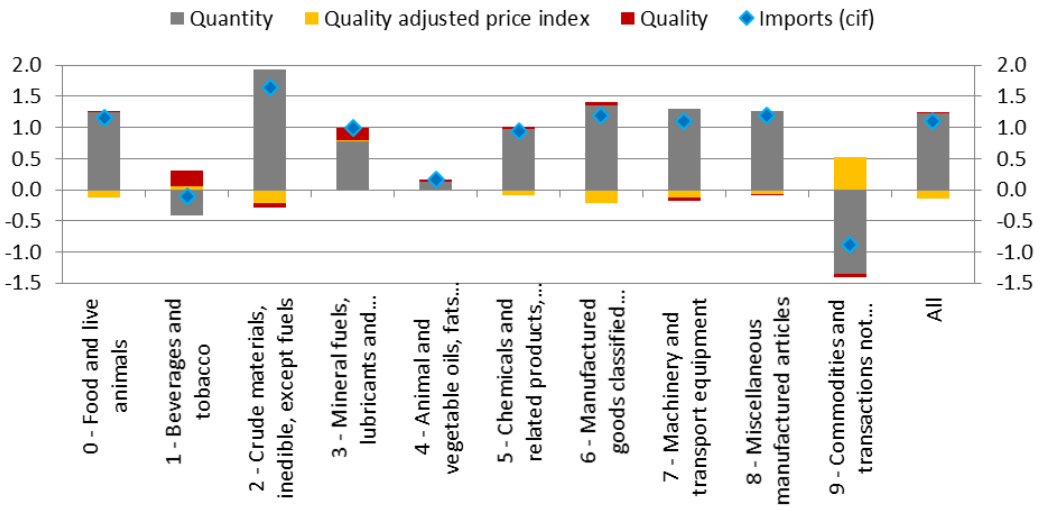
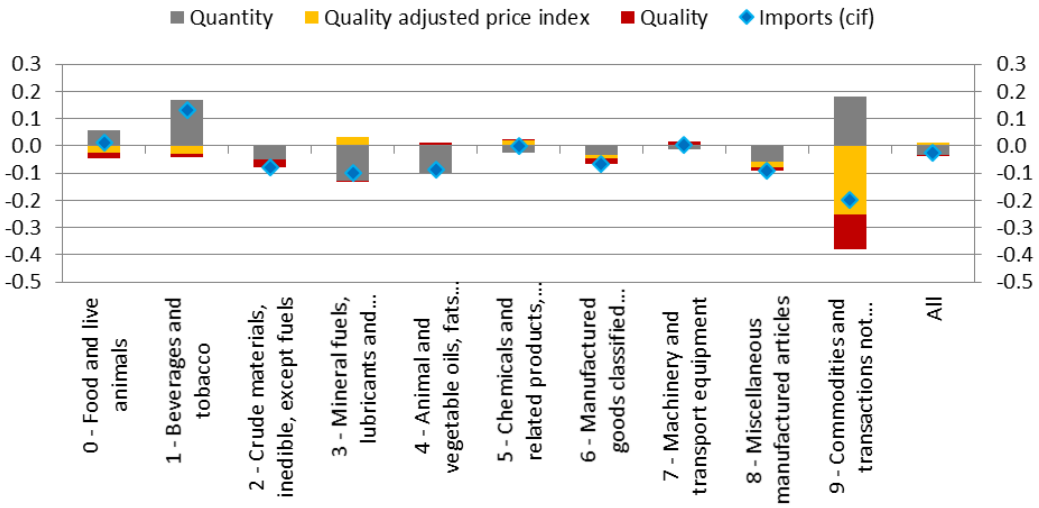


Figure 3-8 – QNTM impact on import of product categories



3.5. Summary and concluding remarks

Non-tariff measures (NTMs) have attracted attentions of politicians and economists since tariffs have fallen after establishment of GATT and WTO. Moreover, various causes and motivations behind the impositions of NTMs make their implications hard to interpret. Complex and opaque nature of these trade policy instruments have been emphasized in the literature. Despite trade impeding consequences of NTMs, quality improvement of the traded products can point to the direction of legitimate motives behind them. Discriminatory behavior and trade restrictiveness of these trade policy instruments have been extensively studied in the literature. However, a visible gap remained for the analyzes studying positive impact of these complex measures on the quality of traded products. In this study, we contributed to the literature by filling this gap.

Using a rich database on NTM notifications of the WTO members, we analyzed the diverse impact of six types of NTMs on traded values, quantities, quality, and prices. Anti-dumping

(ADP), technical barriers to trade (TBT), sanitary and phytosanitary measures (SPS), were three main NTMs of the analysis. In addition, specific trade concerns (STCs) raised on TBT and SPS regulations were other two NTM types under investigation. Countervailing measures (CV), safeguard measures (SG), special safeguards (SSG), and quantitative restrictions (QR) were other types of NTMs classified under other quantitative NTMs (QNTMs) in the analysis. Applying a demand-supply theoretical framework proposed by Feenstra and Romalis (2014) for the measurement of quality of traded goods, we distinguished the impact of NTMs on traded qualities and prices net of quality. In a gravity framework, we observed the diverse role of NTM in trade components.

The outcomes of the analysis points at quality improvement of traded products affected by the TBTs and especially by TBT STCs. This finding is in line with previous study by Ghodsi (2015c) showing the good features of these core NTMs in trade. While the general impact of TBTs on trade flows is positive, traded values and quantities are affected differently by each product category, which gives insights on the diverse characteristics of products and their final use.

In contrast, SPS imposition influences the product quality differently. In spite of observing statistical significant influence of these core NTMs on quality over the whole sample products, different categories of products are affected diversely by SPS. In fact, quality improvement is observed in trade of food and live animals (the most affected category by SPS notifications), mineral fuels, lubricants and related materials; and animal and vegetable oils, fats and waxes; which are usually the categories with the most affected SPS lines. However, our results point to the impeding behavior of these trade policy instruments in general. On the other hand, SPS STCs are in general enhancing trade of products. In fact, trade flows of food and live animals, crude materials, inedible, except fuels, and chemicals and related products (covering 81% of affected lines) are increased with SPS STC. However, major quality improvement by these measures is indicated in other sectors.

The findings of the analysis show that ADP and the rest of quantitative NTMs significantly downgrade the quality of products. While QNTMs are trade restrictive, ADPs enhance trade values and quantities. The ADP is imposed to restrict the low pricing of the imported product under dumping. When the exporter is obliged to import to the destination with higher price after the imposition of ADP, reducing the quality of the exported product can be a good strategy to excuse the low dumping price. This strategy increases the demand and finally the import values of the product under the ADP, which makes the ADP a trade-improving policy instrument rather than a restrictive one.

Dual causality between trade flows and trade policy instruments giving endogeneity problems in the estimations can be mentioned as the weaknesses of the analysis. As robustness check of the presented analysis, Generalized Method of Moments can be applied to control for the endogeneity issues, which could also provide insights on dynamics of trade as well.

3.6. Appendix

3.6.1. Technical Appendix

Equation (3.3) can be reformulated in quality-adjusted terms as

$$\max_{p_{ij}^{\text{fob},rk},z_{ij}^{rk}} \left[\frac{p_{ij}^{\text{fob},rk}}{\left(z_{ij}^{rk}\right)^{\alpha_k}} - \frac{w^r (z_{ij}^{rk})^{1/\theta}/\varphi_{ij}^r}{\left(z_{ij}^{rk}\right)^{\alpha_k}} \right] \frac{(1+\tau_i^{rk})Q_{ij}^{rk}}{(1+t_i^{rk})}$$

(as $Q_{ij}^{rk} = q_{ij}^{rk}\left(z_{ij}^{rk}\right)^{\alpha_k}$) and to tariff-exclusive c.i.f. prices

$$\max_{p_{ij}^{\text{fob},rk},z_{ij}^{rk}} \left[(1+\tau_i^{rk}) \frac{p_{ij}^{\text{fob},rk} + T_i^{rk}}{\left(z_{ij}^{rk}\right)^{\alpha_k}} - (1+\tau_i^{rk}) \frac{\left(\frac{w^r \left(z_{ij}^{rk}\right)^{\frac{1}{\theta}}}{\varphi_i^r} + T_i^{rk} \right)}{\left(z_{ij}^{rk}\right)^{\alpha_k}} \right] \frac{Q_{ij}^{rk}}{(1+t_i^{rk})}$$

which can be rewritten in quality-adjusted c.i.f. prices (net of tariffs)

$$\max_{P_i^{\text{cif},rk},z_i^{rk}} \left[P_{ij}^{\text{cif},rk} - (1+\tau_i^{rk}) \frac{\left(\frac{w^r \left(z_{ij}^{rk}\right)^{\frac{1}{\theta}}}{\varphi_{ij}^r} + T_i^{rk} \right)}{\left(z_{ij}^{rk}\right)^{\alpha_k}} \right] \frac{Q_{ij}^{rk}}{(1+t_i^{rk})} \quad (3)$$

From equations (3.5) the c.i.f./f.o.b. margin can be derived: Denote $\mu^k \coloneqq \left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)$, then the c.i.f./f.o.b.-margin (c.i.f. price including tariffs) is given by

$$\frac{\overline{p_i^{\text{cif},r\,k}}}{\overline{p_i^{\text{fob},r\,k}}} = \frac{\left(1+t_i^{rk}\right)\left(1+\tau_i^{rk}\right)T_i^{rk}\mu}{T_i^{rk}[\mu-1]} = \left(1+t_i^{rk}\right)\left(1+\tau_i^{rk}\right)\frac{\mu^k}{\mu^k-1}$$

Equation (3.8) including the expressions for c.i.f. and f.o.b. prices one gets

$$\hat{P}_i^{\text{cif},rk} = \left[\frac{(1+t_i^{rk})(1+\tau_i^{rk})T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)\right]}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right]\right)^{\alpha^\kappa\theta}} \right] \left[\frac{X_i^{rk}}{\sigma(1+t_i^{rk})N_i^r}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk}) \right]^{\alpha^\kappa\theta}$$

which can be rearranged to

$$\hat{P}_i^{\text{cif},rk} = \left[\frac{(1+t_i^{rk})^{1-\alpha^\kappa\theta}(1+\tau_i^{rk})\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)\right]\left(T_i^{rk}\right)^{1-\alpha^\kappa\theta}}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right]\right)^{\alpha^\kappa\theta}} \right] \left[\frac{X_i^{rk}}{\sigma N_i^r}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk}) \right]^{\alpha^\kappa\theta} \quad (8)$$

In the case of heterogenous firms this equation becomes

$$\overline{P_i^{\text{cif},rk}} = \left[\frac{\overline{p_i^{\text{cif},rk}}}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\overline{p_i^{\text{fob},r\,k}}\right)^{\alpha^\kappa\theta}}\right]\left[\frac{X_i^{rk}/\kappa_2^k(1+t_i^{rk})}{M_i^r(\varphi^r/w^r)^\gamma}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk})\right]^{\frac{\alpha^\kappa\theta}{1+\gamma}}\left(\kappa_2^k\right)^{\frac{1}{1-\sigma}}$$

with $\kappa_2^k = \frac{\gamma}{\gamma-\alpha^k\theta(\sigma-1)} > 1$.

Again inserting and re-arranging yields

$$\overline{P_i^{\text{cif},rk}} = \left[\frac{\left(1+t_i^{rk}\right)\left(1+\tau_i^{rk}\right)T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)\right]}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}T_i^{rk}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right]\right)\right)^{\alpha^\kappa\theta}}\right]\text{x}$$

$$\left[\frac{X_i^{rk}/\kappa_2^k(1+t_i^{rk})}{M_i^r(\varphi^r/w^r)^\gamma}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk})\right]^{\frac{\alpha^\kappa\theta}{1+\gamma}}\left(\kappa_2^k\right)^{\frac{1}{1-\sigma}}$$

which can be simplified to

$$\overline{P_i^{\text{cif},rk}} = \left[\frac{\left(1+t_i^{rk}\right)^{1-\frac{\alpha^\kappa\theta}{1+\gamma}}\left(1+\tau_i^{rk}\right)\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)\right]\left(T_i^{rk}\right)^{1-\alpha^\kappa\theta}}{\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\left(\frac{\alpha^k\theta(\sigma-1)}{1+\alpha^k\theta(\sigma-1)}\left[\left(\frac{\alpha^k\theta}{1-\alpha^k\theta}\right)\left(\frac{\sigma}{\sigma-1}\right)-1\right]\right)\right)^{\alpha^\kappa\theta}}\right] x \left[\frac{X_i^{rk}/\kappa_2^k}{M_i^r(\varphi^r/w^r)^\gamma}\left(\frac{Y^k}{p^k}\right)^{-\beta_0}\exp(-\beta' F^{rk})\right]^{\frac{\alpha^\kappa\theta}{1+\gamma}}(\kappa_2^k)^{\frac{1}{1-\sigma}}$$

3.6.2. Appendix of Tables

Regressions on 10 categories of SITC products at 1-digit are presented next. In all regressions country fixed effects, time fixed effects, and product fixed effects are included. Robust Standard errors clustering country-pairs-product are represented in parentheses; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3.3 – Food and live animals – SITC 0

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	-0.050	-0.059	0.17***	-0.22***	-0.23***	-0.100***	-0.19***	-0.13***	-0.032***	0.075*	-0.027
	(0.034)	(0.034)	(0.038)	(0.016)	(0.016)	(0.0093)	(0.014)	(0.0076)	(0.0032)	(0.033)	(0.034)
Population $_k$	-0.28***	-0.26***	0.089	-0.37***	-0.35***	-0.21***	-0.34***	-0.16***	-0.032***	-0.12*	-0.23***
	(0.054)	(0.054)	(0.060)	(0.024)	(0.024)	(0.015)	(0.021)	(0.012)	(0.0048)	(0.053)	(0.053)
GDP pc $_j$	0.019	0.041	-0.052*	0.071***	0.093***	0.069***	0.069***	0.0019	0.0019	0.017	0.039
	(0.022)	(0.022)	(0.025)	(0.0100)	(0.010)	(0.0060)	(0.0087)	(0.0048)	(0.0020)	(0.022)	(0.022)
GDP pc $_k$	0.18***	0.18***	0.14***	0.045***	0.048***	0.0024	0.030**	0.043***	0.015***	0.14***	0.17***
	(0.025)	(0.025)	(0.027)	(0.011)	(0.011)	(0.0066)	(0.0096)	(0.0053)	(0.0022)	(0.024)	(0.025)
Factor $_K$	-0.0078	-0.0038	-0.028**	0.021***	0.025***	0.011***	0.016***	0.0091***	0.0048***	-0.017	-0.0086
	(0.0093)	(0.0093)	(0.010)	(0.0041)	(0.0041)	(0.0025)	(0.0035)	(0.0020)	(0.00081)	(0.0091)	(0.0092)
Factor $_{Al}$	-0.053**	-0.056**	-0.050*	-0.0026	-0.0064	0.0099	0.0025	-0.012**	-0.0051**	-0.040*	-0.051**
	(0.019)	(0.019)	(0.022)	(0.0088)	(0.0088)	(0.0053)	(0.0076)	(0.0042)	(0.0018)	(0.019)	(0.019)
Tariff	-0.77***	-0.78***	-0.71***	-0.058***	-0.068***	-0.032***	0.81***	-0.026***	-0.87***	-0.75***	0.089*
	(0.042)	(0.042)	(0.047)	(0.014)	(0.014)	(0.0089)	(0.012)	(0.0066)	(0.0031)	(0.042)	(0.043)
Distance	-0.28***	-0.31***	-0.34***	0.062***	0.026***	0.031***	0.051***	0.031***	0.011***	-0.31***	-0.33***
	(0.0077)	(0.0077)	(0.0085)	(0.0029)	(0.0029)	(0.0018)	(0.0025)	(0.0013)	(0.00050)	(0.0076)	(0.0077)
PTA	0.15***	0.15***	0.17***	-0.018***	-0.021***	-0.019***	-0.016***	0.00084	-0.0022**	0.15***	0.15***
	(0.011)	(0.010)	(0.012)	(0.0039)	(0.0039)	(0.0024)	(0.0034)	(0.0018)	(0.00068)	(0.010)	(0.010)
WTO	0.11***	0.11***	0.15***	-0.037***	-0.036***	-0.024***	-0.032***	-0.013***	-0.0046***	0.12***	0.11***
	(0.011)	(0.011)	(0.012)	(0.0045)	(0.0046)	(0.0028)	(0.0040)	(0.0022)	(0.00087)	(0.010)	(0.011)
Contiguity	0.32***	0.32***	0.40***	-0.084***	-0.080***	-0.068***	-0.076***	-0.016***	-0.0077***	0.33***	0.33***
	(0.021)	(0.021)	(0.023)	(0.0073)	(0.0073)	(0.0046)	(0.0065)	(0.0034)	(0.0013)	(0.020)	(0.021)
Com. lang.	0.15***	0.15***	0.14***	0.0020	0.0028	-0.0092**	-0.0012	0.011***	0.0032***	0.13***	0.14***
	(0.014)	(0.014)	(0.016)	(0.0052)	(0.0053)	(0.0033)	(0.0046)	(0.0024)	(0.00090)	(0.014)	(0.014)
Colony	0.20***	0.20***	0.19***	0.012	0.012	-0.0084	0.0047	0.020***	0.0068***	0.18***	0.19***
	(0.021)	(0.021)	(0.024)	(0.0077)	(0.0077)	(0.0048)	(0.0068)	(0.0037)	(0.0014)	(0.021)	(0.022)
Same Ctry.	0.066*	0.063*	0.071*	-0.0043	-0.0071	-0.012	-0.0086	0.0074	0.0043*	0.059*	0.059*
	(0.028)	(0.028)	(0.032)	(0.011)	(0.011)	(0.0070)	(0.0099)	(0.0052)	(0.0020)	(0.028)	(0.028)
ADP	1.15***	1.15***	1.25***	-0.10***	-0.10***	-0.12***	-0.10***	0.016	-0.0024	1.13***	1.15***
	(0.077)	(0.078)	(0.084)	(0.023)	(0.023)	(0.014)	(0.020)	(0.011)	(0.0041)	(0.076)	(0.078)
SPS	-0.0100*	-0.0097*	-0.024***	0.014***	0.014***	0.010***	0.013***	0.0035***	0.00099**	-0.013***	-0.011**
	(0.0041)	(0.0041)	(0.0045)	(0.0016)	(0.0016)	(0.0010)	(0.0014)	(0.00075)	(0.00030)	(0.0040)	(0.0041)
TBT	-0.013***	-0.013***	-0.014***	0.0018	0.0010	0.0015	0.0029*	0.00021	-0.0011***	-0.013***	-0.012***
	(0.0034)	(0.0034)	(0.0038)	(0.0015)	(0.0015)	(0.00089)	(0.0013)	(0.00069)	(0.00029)	(0.0033)	(0.0034)
TBTSTC	-0.038	-0.030	-0.11***	0.068***	0.076***	0.052***	0.060***	0.016***	0.0086***	-0.054*	-0.039
	(0.027)	(0.027)	(0.030)	(0.011)	(0.011)	(0.0066)	(0.0093)	(0.0049)	(0.0020)	(0.027)	(0.027)
SPSSTC	0.42***	0.41***	0.51***	-0.089***	-0.096***	-0.080***	-0.085***	-0.0089	-0.0042*	0.43***	0.42***
	(0.033)	(0.033)	(0.036)	(0.011)	(0.011)	(0.0073)	(0.0099)	(0.0049)	(0.0019)	(0.032)	(0.033)
QNTM	0.014	0.014	0.057	-0.044***	-0.043***	-0.026***	-0.038***	-0.018***	-0.0055***	0.032	0.020
	(0.034)	(0.034)	(0.036)	(0.0090)	(0.0092)	(0.0060)	(0.0082)	(0.0038)	(0.0013)	(0.033)	(0.034)
_cons	7.01***	6.92***	13.5***	-6.45***	-6.55***	-3.57***	-5.75***	-2.88***	-0.71***	9.89***	7.62***
	(0.31)	(0.31)	(0.33)	(0.12)	(0.13)	(0.075)	(0.11)	(0.059)	(0.023)	(0.30)	(0.31)
N	1225158	1225158	1225158	1225158	1225158	1225158	1225158	1225158	1225158	1225158	1225158
R^2	0.209	0.210	0.409	0.752	0.756	0.828	0.757	0.895	0.947	0.409	0.291
adj. R^2	0.208	0.209	0.408	0.752	0.756	0.828	0.757	0.895	0.947	0.408	0.291

Table 3.4 – Beverages and tobacco – SITC 1

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	0.51***	0.59***	0.92***	-0.41***	-0.33***	-0.20***	-0.39***	-0.22***	-0.023***	0.72***	0.61***
	(0.11)	(0.11)	(0.12)	(0.048)	(0.048)	(0.029)	(0.045)	(0.023)	(0.0045)	(0.11)	(0.11)
Population $_k$	0.27	0.27	1.06***	-0.80***	-0.80***	-0.46***	-0.73***	-0.33***	-0.070***	0.60***	0.34*
	(0.15)	(0.15)	(0.17)	(0.068)	(0.068)	(0.041)	(0.064)	(0.032)	(0.0060)	(0.15)	(0.15)
GDP pc $_j$	0.15*	0.16*	0.024	0.12***	0.13***	0.072***	0.11***	0.050***	0.0099***	0.097	0.15*
	(0.067)	(0.067)	(0.072)	(0.030)	(0.030)	(0.018)	(0.028)	(0.014)	(0.0027)	(0.065)	(0.067)
GDP pc $_k$	0.13	0.099	0.11	0.026	-0.0067	-0.010	0.030	0.036*	-0.0044	0.095	0.10
	(0.070)	(0.070)	(0.077)	(0.033)	(0.033)	(0.020)	(0.031)	(0.015)	(0.0029)	(0.069)	(0.070)
Factor $_K$	0.00086	-0.0023	0.035	-0.034**	-0.037***	-0.022***	-0.031**	-0.011*	-0.0029**	0.012	0.00056
	(0.026)	(0.026)	(0.028)	(0.011)	(0.011)	(0.0066)	(0.010)	(0.0050)	(0.00098)	(0.025)	(0.026)
Factor $_{Al}$	0.011	0.022	-0.035	0.046	0.057*	0.032*	0.041	0.014	0.0051*	-0.0028	0.017
	(0.059)	(0.060)	(0.064)	(0.026)	(0.026)	(0.016)	(0.024)	(0.012)	(0.0024)	(0.058)	(0.060)
Tariff	-0.34***	-0.33***	-0.28***	-0.064**	-0.056**	-0.024*	0.87***	-0.040***	-0.93***	-0.30***	0.60***
	(0.051)	(0.051)	(0.054)	(0.021)	(0.021)	(0.012)	(0.020)	(0.0096)	(0.0019)	(0.049)	(0.051)
Distance	-0.32***	-0.33***	-0.40***	0.081***	0.073***	0.060***	0.076***	0.021***	0.0051***	-0.34***	-0.33***
	(0.017)	(0.016)	(0.018)	(0.0065)	(0.0066)	(0.0040)	(0.0061)	(0.0030)	(0.00054)	(0.016)	(0.016)
PTA	0.16***	0.15***	0.14***	0.015	0.012	-0.00028	0.014	0.015***	0.0011	0.14***	0.15***
	(0.024)	(0.024)	(0.026)	(0.0089)	(0.0090)	(0.0055)	(0.0084)	(0.0041)	(0.00076)	(0.024)	(0.024)
WTO	0.14***	0.13***	0.14***	0.0013	-0.0071	-0.012	0.0011	0.013*	0.00021	0.12***	0.13***
	(0.028)	(0.028)	(0.031)	(0.012)	(0.012)	(0.0076)	(0.012)	(0.0058)	(0.0011)	(0.028)	(0.028)
Contiguity	0.37***	0.38***	0.39***	-0.016	-0.0062	-0.027*	-0.018	0.011	0.0022	0.36***	0.38***
	(0.048)	(0.048)	(0.051)	(0.017)	(0.017)	(0.011)	(0.016)	(0.0080)	(0.0015)	(0.046)	(0.048)
Com. lang.	0.14***	0.14***	0.16***	-0.026*	-0.027*	-0.023**	-0.024*	-0.0036	-0.0020*	0.14***	0.14***
	(0.033)	(0.033)	(0.035)	(0.012)	(0.012)	(0.0075)	(0.011)	(0.0055)	(0.00100)	(0.032)	(0.033)
Colony	0.21***	0.21***	0.23***	-0.018	-0.020	-0.023*	-0.018	0.0050	-0.00011	0.21***	0.21***
	(0.050)	(0.049)	(0.053)	(0.017)	(0.017)	(0.011)	(0.016)	(0.0077)	(0.0014)	(0.048)	(0.050)
Same Ctry.	0.46***	0.45***	0.54***	-0.075**	-0.081**	-0.064***	-0.074**	-0.011	-0.0013	0.47***	0.46***
	(0.061)	(0.061)	(0.065)	(0.026)	(0.026)	(0.016)	(0.025)	(0.012)	(0.0023)	(0.059)	(0.061)
ADP	-0.10	-0.25	-0.41	0.31*	0.16	0.046	0.27	0.26***	0.040**	-0.36	-0.29
	(0.29)	(0.29)	(0.34)	(0.16)	(0.16)	(0.11)	(0.14)	(0.066)	(0.012)	(0.28)	(0.29)
SPS	0.010	0.018	0.054***	-0.043***	-0.036***	-0.020***	-0.040***	-0.023***	-0.0030***	0.034*	0.021
	(0.016)	(0.016)	(0.016)	(0.0057)	(0.0057)	(0.0035)	(0.0054)	(0.0027)	(0.00045)	(0.015)	(0.016)
TBT	-0.028*	-0.0095	-0.050***	0.022***	0.041***	0.031***	0.022***	-0.0088**	0.00017	-0.019	-0.0096
	(0.013)	(0.013)	(0.014)	(0.0054)	(0.0053)	(0.0033)	(0.0050)	(0.0027)	(0.00047)	(0.013)	(0.013)
TBTSTC	0.22**	0.23**	0.32***	-0.098**	-0.087**	-0.063***	-0.091***	-0.035*	-0.0066**	0.25**	0.24**
	(0.081)	(0.082)	(0.087)	(0.030)	(0.030)	(0.019)	(0.028)	(0.014)	(0.0026)	(0.079)	(0.082)
SPSSTC	0.091	0.11	0.16	-0.071	-0.055	-0.051	-0.066	-0.021	-0.0050	0.11	0.11
	(0.12)	(0.12)	(0.13)	(0.052)	(0.050)	(0.033)	(0.048)	(0.024)	(0.0041)	(0.12)	(0.12)
QNTM	0.13	0.13	0.17*	-0.039	-0.040	-0.029	-0.040	-0.011	0.00073	0.14	0.13
	(0.080)	(0.080)	(0.081)	(0.025)	(0.024)	(0.015)	(0.023)	(0.012)	(0.0020)	(0.076)	(0.080)
_cons	2.84***	2.72***	4.55***	-1.71***	-1.83***	-0.89***	-1.73***	-0.81***	0.028	3.65***	2.70***
	(0.64)	(0.64)	(0.71)	(0.30)	(0.30)	(0.18)	(0.28)	(0.14)	(0.027)	(0.63)	(0.65)
N	181588	181588	181588	181588	181588	181588	181588	181588	181588	181588	181588
R^2	0.215	0.228	0.810	0.962	0.961	0.961	0.962	0.955	0.968	0.533	0.246
adj. R^2	0.214	0.226	0.810	0.961	0.961	0.961	0.962	0.954	0.968	0.532	0.245

Table 3.5 – Crude materials, inedible, except fuels – SITC 2

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	-0.073	-0.043	0.36***	-0.43***	-0.40***	-0.21***	-0.37***	-0.22***	-0.061***	0.14**	0.018
	(0.056)	(0.057)	(0.068)	(0.032)	(0.032)	(0.022)	(0.028)	(0.014)	(0.0055)	(0.055)	(0.057)
Population $_k$	-0.26***	-0.29***	-0.20*	-0.054	-0.086*	-0.093***	-0.095**	0.039*	0.041***	-0.30***	-0.33***
	(0.071)	(0.071)	(0.081)	(0.036)	(0.036)	(0.025)	(0.032)	(0.016)	(0.0061)	(0.068)	(0.070)
GDP pc $_j$	0.23***	0.21***	0.24***	-0.0089	-0.024	-0.0091	-0.0090	0.00018	0.000066	0.23***	0.21***
	(0.034)	(0.034)	(0.040)	(0.019)	(0.019)	(0.013)	(0.017)	(0.0083)	(0.0033)	(0.033)	(0.034)
GDP pc $_k$	0.038	0.053	-0.12**	0.15***	0.17***	0.073***	0.13***	0.082***	0.029***	-0.044	0.024
	(0.035)	(0.035)	(0.041)	(0.019)	(0.019)	(0.013)	(0.017)	(0.0084)	(0.0033)	(0.034)	(0.035)
Factor $_K$	0.056***	0.067***	0.052***	0.0035	0.014*	-0.011*	0.00030	0.015***	0.0032**	0.041**	0.063***
	(0.013)	(0.013)	(0.015)	(0.0065)	(0.0066)	(0.0046)	(0.0059)	(0.0028)	(0.0011)	(0.012)	(0.013)
Factor $_{Al}$	0.0040	-0.012	0.030	-0.026	-0.042**	-0.012	-0.022	-0.014*	-0.0044	0.018	-0.0079
	(0.029)	(0.029)	(0.034)	(0.016)	(0.016)	(0.011)	(0.014)	(0.0071)	(0.0028)	(0.028)	(0.029)
Tariff	-0.10	-0.082	0.090	-0.19***	-0.17***	-0.13***	0.71***	-0.065***	-0.91***	-0.040	0.83***
	(0.093)	(0.093)	(0.10)	(0.032)	(0.032)	(0.024)	(0.030)	(0.013)	(0.0046)	(0.090)	(0.093)
Distance	-0.21***	-0.24***	-0.33***	0.12***	0.084***	0.074***	0.11***	0.048***	0.015***	-0.25***	-0.26***
	(0.010)	(0.010)	(0.012)	(0.0045)	(0.0045)	(0.0033)	(0.0041)	(0.0017)	(0.00062)	(0.0098)	(0.010)
PTA	0.077***	0.078***	0.089***	-0.012*	-0.011	-0.014**	-0.012*	0.0011	-0.00091	0.076***	0.079***
	(0.013)	(0.013)	(0.016)	(0.0060)	(0.0060)	(0.0044)	(0.0054)	(0.0023)	(0.00085)	(0.013)	(0.013)
WTO	0.092***	0.090***	0.14***	-0.050***	-0.051***	-0.039***	-0.047***	-0.011***	-0.0033**	0.10***	0.094***
	(0.015)	(0.015)	(0.017)	(0.0072)	(0.0072)	(0.0050)	(0.0064)	(0.0031)	(0.0012)	(0.014)	(0.015)
Contiguity	0.28***	0.28***	0.41***	-0.13***	-0.13***	-0.10***	-0.12***	-0.030***	-0.015***	0.31***	0.30***
	(0.025)	(0.025)	(0.029)	(0.011)	(0.011)	(0.0079)	(0.0097)	(0.0042)	(0.0015)	(0.025)	(0.026)
Com. lang.	0.041*	0.042*	0.044*	-0.0026	-0.0022	-0.0064	-0.0016	0.0038	-0.0010	0.037*	0.043*
	(0.019)	(0.019)	(0.022)	(0.0081)	(0.0081)	(0.0061)	(0.0074)	(0.0030)	(0.0011)	(0.018)	(0.019)
Colony	0.11***	0.11***	0.16***	-0.050***	-0.050***	-0.042***	-0.046***	-0.0083	-0.0039*	0.11***	0.11***
	(0.026)	(0.026)	(0.031)	(0.012)	(0.012)	(0.0086)	(0.011)	(0.0043)	(0.0016)	(0.026)	(0.026)
Same Ctry.	0.092*	0.098**	0.051	0.041*	0.048**	0.029*	0.038*	0.012	0.0024	0.080*	0.096*
	(0.037)	(0.037)	(0.043)	(0.017)	(0.017)	(0.013)	(0.016)	(0.0068)	(0.0025)	(0.036)	(0.037)
ADP	1.65***	1.71***	1.93***	-0.28***	-0.22***	-0.22***	-0.23***	-0.061***	-0.051***	1.71***	1.76***
	(0.15)	(0.15)	(0.16)	(0.042)	(0.042)	(0.030)	(0.036)	(0.018)	(0.0079)	(0.15)	(0.15)
SPS	0.031***	0.020*	0.032**	-0.00066	-0.011*	-0.0071	-0.0022	0.0065***	0.0015*	0.024**	0.019*
	(0.0091)	(0.0091)	(0.011)	(0.0048)	(0.0048)	(0.0038)	(0.0044)	(0.0016)	(0.00064)	(0.0087)	(0.0091)
TBT	0.0088	0.0041	0.051***	-0.042***	-0.047***	-0.023***	-0.038***	-0.019***	-0.0036***	0.027**	0.0077
	(0.0096)	(0.0096)	(0.011)	(0.0047)	(0.0048)	(0.0037)	(0.0043)	(0.0016)	(0.00069)	(0.0092)	(0.0096)
TBTSTC	0.14*	0.14*	0.045	0.092**	0.099***	0.061**	0.084**	0.031**	0.0079	0.11	0.14*
	(0.062)	(0.062)	(0.072)	(0.028)	(0.028)	(0.022)	(0.026)	(0.0099)	(0.0046)	(0.060)	(0.062)
SPSSTC	0.42***	0.25**	0.28**	0.14**	-0.035	-0.082*	0.066	0.22***	0.071***	0.20**	0.18*
	(0.076)	(0.075)	(0.092)	(0.045)	(0.043)	(0.034)	(0.040)	(0.021)	(0.0082)	(0.071)	(0.076)
QNTM	-0.077**	-0.077**	-0.048	-0.029	-0.028	0.0018	-0.016	-0.031***	-0.013***	-0.047	-0.064*
	(0.028)	(0.028)	(0.033)	(0.015)	(0.015)	(0.011)	(0.014)	(0.0058)	(0.0024)	(0.027)	(0.028)
_cons	5.22***	5.39***	12.6***	-7.36***	-7.20***	-4.09***	-6.40***	-3.27***	-0.96***	8.49***	6.34***
	(0.35)	(0.35)	(0.42)	(0.19)	(0.18)	(0.13)	(0.17)	(0.077)	(0.028)	(0.35)	(0.36)
N	708989	708989	708989	708989	708989	708989	708989	708989	708989	708989	708989
R^2	0.223	0.221	0.546	0.840	0.836	0.855	0.843	0.922	0.935	0.513	0.307
adj. R^2	0.223	0.220	0.546	0.840	0.836	0.854	0.843	0.922	0.935	0.513	0.306

Table 3.6 – Mineral fuels, lubricants and related materials – SITC 3

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	-1.29***	-1.29***	-1.13***	-0.17**	-0.16**	-0.011	-0.15***	-0.15***	-0.013	-1.14***	-1.27***
	(0.15)	(0.15)	(0.18)	(0.057)	(0.057)	(0.036)	(0.043)	(0.033)	(0.018)	(0.15)	(0.15)
Population $_k$	0.81***	0.82***	0.65***	0.16**	0.17***	0.025	0.16***	0.14***	-0.0014	0.68***	0.82***
	(0.17)	(0.17)	(0.19)	(0.049)	(0.049)	(0.036)	(0.040)	(0.031)	(0.016)	(0.16)	(0.17)
GDP pc $_j$	-0.25**	-0.26**	-0.34**	0.089**	0.087**	0.052*	0.059*	0.038*	0.031**	-0.29**	-0.29**
	(0.095)	(0.095)	(0.11)	(0.032)	(0.032)	(0.022)	(0.024)	(0.019)	(0.011)	(0.091)	(0.095)
GDP pc $_k$	0.71***	0.72***	0.57***	0.14***	0.14***	0.018	0.11***	0.12***	0.030**	0.59***	0.69***
	(0.097)	(0.097)	(0.11)	(0.032)	(0.033)	(0.022)	(0.025)	(0.020)	(0.011)	(0.091)	(0.096)
Factor $_K$	0.16***	0.16***	0.16***	-0.0041	-0.0015	-0.016*	-0.00071	0.011	-0.0034	0.15***	0.16***
	(0.034)	(0.033)	(0.037)	(0.011)	(0.011)	(0.0073)	(0.0087)	(0.0068)	(0.0036)	(0.032)	(0.033)
Factor $_{Al}$	-0.41***	-0.41***	-0.46***	0.048	0.047	0.049*	0.026	-0.00031	0.022*	-0.41***	-0.43***
	(0.085)	(0.085)	(0.096)	(0.028)	(0.028)	(0.019)	(0.022)	(0.017)	(0.0093)	(0.080)	(0.084)
Tariff	-0.22	-0.23	-0.34	0.12	0.11	-0.0048	0.82***	0.12***	-0.70***	-0.34	0.47*
	(0.19)	(0.19)	(0.22)	(0.065)	(0.065)	(0.044)	(0.050)	(0.038)	(0.021)	(0.18)	(0.19)
Distance	-0.35***	-0.39***	-0.43***	0.075***	0.036***	0.066***	0.062***	0.0093*	0.013***	-0.36***	-0.41***
	(0.024)	(0.024)	(0.027)	(0.0071)	(0.0071)	(0.0052)	(0.0056)	(0.0041)	(0.0021)	(0.023)	(0.024)
PTA	0.083*	0.086**	0.084*	-0.0017	0.0016	-0.017*	-0.0087	0.015**	0.0070*	0.068*	0.079*
	(0.033)	(0.033)	(0.037)	(0.0096)	(0.0096)	(0.0069)	(0.0075)	(0.0056)	(0.0029)	(0.031)	(0.033)
WTO	0.0041	0.0049	0.023	-0.019	-0.018	-0.014	-0.021*	-0.0052	0.0018	0.0093	0.0031
	(0.036)	(0.036)	(0.041)	(0.012)	(0.012)	(0.0079)	(0.0092)	(0.0072)	(0.0039)	(0.034)	(0.036)
Contiguity	0.24***	0.24***	0.31***	-0.063***	-0.062***	-0.059***	-0.058***	-0.0043	-0.0052	0.25***	0.25***
	(0.057)	(0.057)	(0.063)	(0.015)	(0.015)	(0.012)	(0.012)	(0.0092)	(0.0045)	(0.054)	(0.057)
Com. lang.	-0.10*	-0.11*	-0.17***	0.061***	0.061***	0.045***	0.057***	0.017*	0.0044	-0.12**	-0.11*
	(0.043)	(0.043)	(0.049)	(0.013)	(0.013)	(0.0095)	(0.011)	(0.0074)	(0.0038)	(0.041)	(0.043)
Colony	0.15*	0.15*	0.20**	-0.055**	-0.053**	-0.051***	-0.052***	-0.0037	-0.0028	0.15**	0.15**
	(0.059)	(0.059)	(0.067)	(0.018)	(0.018)	(0.013)	(0.015)	(0.0099)	(0.0051)	(0.056)	(0.059)
Same Ctry.	0.26**	0.26**	0.26**	-0.0015	-0.0042	-0.036*	-0.013	0.034*	0.011	0.23**	0.25**
	(0.083)	(0.083)	(0.092)	(0.022)	(0.022)	(0.017)	(0.017)	(0.013)	(0.0066)	(0.078)	(0.082)
ADP	0.99***	0.98***	0.78**	0.21***	0.20***	0.0081	0.17***	0.20***	0.037	0.79***	0.95***
	(0.27)	(0.27)	(0.28)	(0.060)	(0.060)	(0.055)	(0.049)	(0.051)	(0.030)	(0.23)	(0.25)
SPS	-0.058*	-0.049	-0.097**	0.040***	0.048***	0.030***	0.030***	0.0094	0.0093**	-0.067*	-0.059*
	(0.029)	(0.028)	(0.032)	(0.0090)	(0.0092)	(0.0064)	(0.0068)	(0.0059)	(0.0033)	(0.026)	(0.028)
TBT	-0.20***	-0.19***	-0.29***	0.087***	0.097***	0.062***	0.066***	0.024***	0.020***	-0.23***	-0.21***
	(0.023)	(0.023)	(0.027)	(0.0082)	(0.0083)	(0.0055)	(0.0060)	(0.0052)	(0.0031)	(0.022)	(0.023)
TBTSTC	0.42**	0.43**	0.13	0.29***	0.30***	0.018	0.15**	0.27***	0.14***	0.15	0.29*
	(0.14)	(0.13)	(0.17)	(0.070)	(0.070)	(0.044)	(0.053)	(0.038)	(0.022)	(0.13)	(0.14)
SPSSTC	0.20	0.21	-0.037	0.24	0.24	0.14	0.23*	0.099	0.0082	0.10	0.20
	(0.37)	(0.37)	(0.42)	(0.13)	(0.13)	(0.088)	(0.094)	(0.087)	(0.051)	(0.35)	(0.37)
QNTM	-0.10	-0.093	-0.13	0.027	0.034	0.031	0.027	-0.0036	0.00030	-0.097	-0.093
	(0.080)	(0.080)	(0.090)	(0.029)	(0.029)	(0.018)	(0.021)	(0.019)	(0.011)	(0.075)	(0.079)
_cons	7.97***	8.13***	18.2***	-10.3***	-10.1***	-4.91***	-8.17***	-5.35***	-2.09***	13.3***	10.2***
	(0.77)	(0.77)	(0.86)	(0.25)	(0.25)	(0.17)	(0.19)	(0.15)	(0.078)	(0.73)	(0.77)
N	129168	129168	129168	129168	129168	129168	129168	129168	129168	129168	129168
R^2	0.512	0.516	0.620	0.834	0.840	0.842	0.878	0.884	0.929	0.636	0.560
adj. R^2	0.511	0.514	0.619	0.834	0.840	0.842	0.877	0.883	0.929	0.635	0.559

Table 3.7 – Animal and vegetable oils, fats and waxes – SITC 4

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	-0.30*	-0.30*	-0.13	-0.17***	-0.17***	-0.070*	-0.12**	-0.097***	-0.049***	-0.20	-0.26*
	(0.12)	(0.12)	(0.14)	(0.047)	(0.047)	(0.030)	(0.038)	(0.022)	(0.012)	(0.12)	(0.12)
Population $_k$	0.52**	0.53**	1.19***	-0.66***	-0.66***	-0.54***	-0.62***	-0.13***	-0.044*	0.65***	0.57**
	(0.18)	(0.18)	(0.21)	(0.069)	(0.069)	(0.045)	(0.057)	(0.032)	(0.018)	(0.18)	(0.18)
GDP pc $_j$	-0.068	-0.058	-0.12	0.047	0.057*	0.050**	0.048*	-0.0026	-0.0011	-0.065	-0.057
	(0.071)	(0.071)	(0.081)	(0.028)	(0.028)	(0.018)	(0.023)	(0.013)	(0.0070)	(0.070)	(0.071)
GDP pc $_k$	0.41***	0.41***	0.41***	0.00016	0.0018	-0.045*	-0.023	0.045**	0.023**	0.36***	0.39***
	(0.081)	(0.081)	(0.092)	(0.032)	(0.032)	(0.021)	(0.026)	(0.015)	(0.0085)	(0.081)	(0.082)
Factor $_K$	0.064*	0.068*	0.027	0.037***	0.042***	0.020**	0.026**	0.017***	0.011***	0.047	0.057
	(0.031)	(0.031)	(0.035)	(0.011)	(0.011)	(0.0075)	(0.0092)	(0.0051)	(0.0028)	(0.031)	(0.031)
Factor $_{Al}$	-0.18**	-0.18**	-0.20**	0.020	0.019	0.035*	0.030	-0.015	-0.010	-0.16**	-0.17**
	(0.061)	(0.061)	(0.070)	(0.024)	(0.024)	(0.016)	(0.020)	(0.011)	(0.0060)	(0.061)	(0.062)
Tariff	-0.40**	-0.41**	-0.34*	-0.063	-0.073	-0.031	0.69***	-0.031	-0.76***	-0.37**	0.34*
	(0.13)	(0.13)	(0.15)	(0.045)	(0.044)	(0.029)	(0.036)	(0.020)	(0.011)	(0.13)	(0.13)
Distance	-0.20***	-0.22***	-0.28***	0.088***	0.066***	0.050***	0.068***	0.038***	0.020***	-0.23***	-0.24***
	(0.023)	(0.023)	(0.026)	(0.0080)	(0.0080)	(0.0055)	(0.0067)	(0.0034)	(0.0018)	(0.023)	(0.023)
PTA	0.086**	0.088**	0.094**	-0.0077	-0.0060	-0.014*	-0.0077	0.0067	0.000011	0.079*	0.088**
	(0.031)	(0.031)	(0.036)	(0.010)	(0.010)	(0.0071)	(0.0086)	(0.0044)	(0.0023)	(0.031)	(0.032)
WTO	0.0038	0.0026	-0.013	0.017	0.016	0.0048	0.010	0.012*	0.0067*	-0.0082	-0.0042
	(0.036)	(0.036)	(0.039)	(0.012)	(0.012)	(0.0079)	(0.0100)	(0.0057)	(0.0031)	(0.035)	(0.036)
Contiguity	0.26***	0.26***	0.26***	-0.0025	-0.0018	-0.015	-0.0013	0.013	-0.0011	0.24***	0.26***
	(0.055)	(0.055)	(0.063)	(0.018)	(0.018)	(0.012)	(0.015)	(0.0077)	(0.0039)	(0.055)	(0.056)
Com. lang.	0.080	0.080	0.056	0.024	0.024	0.012	0.021	0.013*	0.0035	0.067	0.077
	(0.041)	(0.041)	(0.047)	(0.015)	(0.015)	(0.0099)	(0.012)	(0.0063)	(0.0032)	(0.041)	(0.042)
Colony	0.059	0.059	0.066	-0.0071	-0.0072	-0.013	-0.013	0.0062	0.0059	0.053	0.053
	(0.061)	(0.061)	(0.071)	(0.023)	(0.023)	(0.015)	(0.019)	(0.010)	(0.0055)	(0.061)	(0.062)
Same Ctry.	0.21*	0.21*	0.15	0.063*	0.065*	0.027	0.049*	0.036**	0.014*	0.17*	0.20*
	(0.085)	(0.085)	(0.095)	(0.026)	(0.026)	(0.018)	(0.022)	(0.012)	(0.0060)	(0.083)	(0.086)
ADP	0.17	0.17	0.13	0.038	0.037	0.00014	0.018	0.038	0.020	0.13	0.15
	(0.15)	(0.15)	(0.18)	(0.057)	(0.057)	(0.036)	(0.043)	(0.028)	(0.018)	(0.16)	(0.16)
SPS	-0.011	-0.010	-0.035**	0.024***	0.025***	0.017***	0.022***	0.0077***	0.0027*	-0.019	-0.013
	(0.011)	(0.011)	(0.013)	(0.0051)	(0.0051)	(0.0033)	(0.0042)	(0.0023)	(0.0012)	(0.011)	(0.011)
TBT	-0.012	-0.013	-0.0040	-0.0083	-0.0090	-0.0032	-0.0054	-0.0052*	-0.0030*	-0.0071	-0.0100
	(0.011)	(0.011)	(0.013)	(0.0049)	(0.0049)	(0.0033)	(0.0041)	(0.0023)	(0.0013)	(0.011)	(0.011)
TBTSTC	-0.31***	-0.30***	-0.50***	0.19***	0.20***	0.13***	0.15***	0.064***	0.041***	-0.37***	-0.34***
	(0.076)	(0.076)	(0.091)	(0.033)	(0.033)	(0.022)	(0.027)	(0.014)	(0.0078)	(0.077)	(0.078)
SPSSTC	-0.38***	-0.38***	-0.46***	0.074	0.077	0.064*	0.051	0.010	0.022*	-0.39***	-0.40***
	(0.097)	(0.097)	(0.12)	(0.044)	(0.044)	(0.029)	(0.038)	(0.018)	(0.0092)	(0.10)	(0.100)
QNTM	-0.087	-0.088	-0.098	0.011	0.010	0.0045	0.0022	0.0065	0.0088	-0.094	-0.097
	(0.063)	(0.063)	(0.073)	(0.027)	(0.027)	(0.018)	(0.022)	(0.013)	(0.0083)	(0.063)	(0.065)
_cons	3.64***	3.63***	9.71***	-6.07***	-6.08***	-2.58***	-4.60***	-3.49***	-1.47***	7.13***	5.10***
	(0.74)	(0.74)	(0.96)	(0.40)	(0.40)	(0.34)	(0.36)	(0.13)	(0.071)	(0.73)	(0.74)
N	118879	118879	118879	118879	118879	118879	118879	118879	118879	118879	118879
R^2	0.239	0.240	0.327	0.566	0.574	0.816	0.725	0.913	0.962	0.427	0.375
adj. R^2	0.237	0.237	0.325	0.565	0.572	0.816	0.724	0.913	0.962	0.425	0.373

Table 3.8 – Chemicals and related products, n.e.s. – SITC 5

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	-0.074*	-0.076*	0.083*	-0.16***	-0.16***	-0.10***	-0.15***	-0.056***	-0.0084**	-0.018	-0.068*
	(0.031)	(0.031)	(0.036)	(0.018)	(0.018)	(0.012)	(0.016)	(0.0069)	(0.0032)	(0.030)	(0.030)
Population $_k$	0.20***	0.21***	0.46***	-0.27***	-0.26***	-0.22***	-0.25***	-0.050***	-0.013**	0.25***	0.22***
	(0.046)	(0.046)	(0.055)	(0.024)	(0.024)	(0.017)	(0.021)	(0.0094)	(0.0045)	(0.045)	(0.046)
GDP pc $_j$	0.052**	0.066***	-0.0040	0.055***	0.070***	0.060***	0.055***	-0.0049	0.00046	0.056**	0.066***
	(0.019)	(0.019)	(0.022)	(0.011)	(0.011)	(0.0074)	(0.0094)	(0.0041)	(0.0019)	(0.018)	(0.019)
GDP pc $_k$	0.51***	0.52***	0.48***	0.035**	0.040**	-0.023**	0.012	0.058***	0.023***	0.46***	0.50***
	(0.022)	(0.022)	(0.026)	(0.012)	(0.012)	(0.0086)	(0.011)	(0.0047)	(0.0022)	(0.021)	(0.022)
Factor $_K$	-0.11***	-0.11***	-0.16***	0.053***	0.057***	0.043***	0.047***	0.0099***	0.0056***	-0.12***	-0.11***
	(0.0076)	(0.0076)	(0.0090)	(0.0042)	(0.0042)	(0.0029)	(0.0037)	(0.0016)	(0.00076)	(0.0074)	(0.0076)
Factor $_{Al}$	-0.039*	-0.042*	-0.044*	0.0052	0.0023	0.0077	0.0061	-0.0026	-0.00092	-0.036*	-0.041*
	(0.017)	(0.017)	(0.020)	(0.0095)	(0.0095)	(0.0066)	(0.0083)	(0.0037)	(0.0017)	(0.016)	(0.017)
Tariff	-0.43***	-0.43***	-0.39***	-0.040	-0.043*	-0.014	0.85***	-0.026***	-0.89***	-0.40***	0.46***
	(0.049)	(0.049)	(0.057)	(0.021)	(0.021)	(0.015)	(0.019)	(0.0078)	(0.0036)	(0.049)	(0.049)
Distance	-0.52***	-0.54***	-0.65***	0.13***	0.11***	0.11***	0.12***	0.018***	0.010***	-0.54***	-0.55***
	(0.0063)	(0.0063)	(0.0074)	(0.0029)	(0.0029)	(0.0021)	(0.0026)	(0.0010)	(0.00044)	(0.0062)	(0.0063)
PTA	0.14***	0.14***	0.16***	-0.019***	-0.019***	-0.021***	-0.017***	0.0024	-0.0011	0.14***	0.15***
	(0.0081)	(0.0081)	(0.0095)	(0.0039)	(0.0039)	(0.0028)	(0.0035)	(0.0014)	(0.00059)	(0.0079)	(0.0080)
WTO	0.15***	0.15***	0.16***	-0.0063	-0.0057	-0.011***	-0.0045	0.0052**	-0.0017*	0.15***	0.16***
	(0.0090)	(0.0090)	(0.011)	(0.0045)	(0.0045)	(0.0032)	(0.0040)	(0.0017)	(0.00078)	(0.0087)	(0.0089)
Contiguity	0.33***	0.33***	0.37***	-0.041***	-0.040***	-0.050***	-0.038***	0.0090***	-0.0029**	0.32***	0.33***
	(0.017)	(0.017)	(0.020)	(0.0073)	(0.0073)	(0.0054)	(0.0066)	(0.0026)	(0.0011)	(0.017)	(0.017)
Com. lang.	0.085***	0.085***	0.10***	-0.019***	-0.020***	-0.019***	-0.017***	-0.00059	-0.0027***	0.086***	0.087***
	(0.011)	(0.011)	(0.013)	(0.0052)	(0.0052)	(0.0038)	(0.0047)	(0.0019)	(0.00076)	(0.011)	(0.011)
Colony	0.28***	0.28***	0.30***	-0.022**	-0.020**	-0.032***	-0.024***	0.0098***	0.0024*	0.27***	0.28***
	(0.016)	(0.016)	(0.019)	(0.0074)	(0.0074)	(0.0054)	(0.0067)	(0.0027)	(0.0011)	(0.016)	(0.016)
Same Ctry.	0.22***	0.22***	0.20***	0.027*	0.026*	-0.00054	0.016	0.027***	0.011***	0.20***	0.21***
	(0.026)	(0.026)	(0.029)	(0.011)	(0.011)	(0.0081)	(0.010)	(0.0041)	(0.0018)	(0.025)	(0.026)
ADP	0.94***	0.94***	0.97***	-0.034	-0.036*	-0.083***	-0.043**	0.049***	0.0096***	0.89***	0.93***
	(0.038)	(0.038)	(0.044)	(0.018)	(0.018)	(0.014)	(0.016)	(0.0061)	(0.0027)	(0.037)	(0.038)
SPS	0.0044	0.0062	0.0075	-0.0031	-0.0012	-0.00088	-0.0021	-0.0022*	-0.00094*	0.0066	0.0072
	(0.0056)	(0.0056)	(0.0064)	(0.0025)	(0.0025)	(0.0018)	(0.0022)	(0.00095)	(0.00041)	(0.0054)	(0.0056)
TBT	0.016***	0.016***	0.010	0.0055**	0.0059**	0.0043**	0.0055**	0.0013	0.000064	0.014**	0.016***
	(0.0045)	(0.0045)	(0.0052)	(0.0021)	(0.0021)	(0.0015)	(0.0019)	(0.00079)	(0.00036)	(0.0044)	(0.0045)
TBTSTC	0.20***	0.20***	0.15***	0.054***	0.053***	0.026***	0.038***	0.028***	0.015***	0.18***	0.19***
	(0.022)	(0.022)	(0.026)	(0.011)	(0.011)	(0.0077)	(0.0095)	(0.0040)	(0.0019)	(0.022)	(0.022)
SPSSTC	0.27***	0.28***	0.31***	-0.041	-0.039	-0.043**	-0.032	0.0020	-0.0082	0.27***	0.28***
	(0.048)	(0.048)	(0.055)	(0.024)	(0.024)	(0.016)	(0.021)	(0.0095)	(0.0044)	(0.047)	(0.048)
QNTM	0.0018	0.0034	-0.023	0.025***	0.026***	0.021***	0.023***	0.0035	0.0019	-0.0017	0.0015
	(0.011)	(0.011)	(0.012)	(0.0058)	(0.0058)	(0.0042)	(0.0051)	(0.0021)	(0.0010)	(0.010)	(0.010)
_cons	3.39***	3.30***	9.60***	-6.21***	-6.29***	-3.68***	-5.46***	-2.53***	-0.75***	5.92***	4.06***
	(0.23)	(0.23)	(0.28)	(0.14)	(0.14)	(0.10)	(0.13)	(0.051)	(0.024)	(0.23)	(0.23)
N	1790401	1790401	1790401	1790401	1790401	1790401	1790401	1790401	1790401	1790401	1790401
R^2	0.343	0.345	0.497	0.762	0.767	0.737	0.750	0.893	0.879	0.465	0.371
adj. R^2	0.343	0.345	0.497	0.762	0.767	0.737	0.750	0.893	0.879	0.464	0.370

Table 3.9 – Manufactured goods classified chiefly by material – SITC 6

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	0.056*	0.051*	0.077**	-0.022	-0.026*	-0.017*	-0.025*	-0.0046	0.0038	0.060**	0.047*
	(0.022)	(0.022)	(0.025)	(0.012)	(0.012)	(0.0072)	(0.0099)	(0.0055)	(0.0025)	(0.021)	(0.022)
Population $_k$	-0.080*	-0.085*	0.42***	-0.50***	-0.51***	-0.31***	-0.43***	-0.20***	-0.080***	0.12***	-0.0050
	(0.035)	(0.035)	(0.041)	(0.018)	(0.018)	(0.011)	(0.015)	(0.0083)	(0.0038)	(0.034)	(0.035)
GDP pc $_j$	0.12***	0.13***	0.039*	0.081***	0.092***	0.064***	0.075***	0.017***	0.0060***	0.10***	0.13***
	(0.014)	(0.014)	(0.016)	(0.0074)	(0.0074)	(0.0046)	(0.0063)	(0.0035)	(0.0016)	(0.014)	(0.014)
GDP pc $_k$	0.48***	0.49***	0.46***	0.024**	0.033***	-0.031***	-0.00013	0.055***	0.024***	0.42***	0.46***
	(0.016)	(0.016)	(0.019)	(0.0083)	(0.0084)	(0.0052)	(0.0071)	(0.0040)	(0.0018)	(0.016)	(0.016)
Factor $_K$	-0.13***	-0.13***	-0.19***	0.058***	0.061***	0.044***	0.051***	0.015***	0.0074***	-0.14***	-0.13***
	(0.0057)	(0.0057)	(0.0065)	(0.0028)	(0.0029)	(0.0018)	(0.0024)	(0.0013)	(0.00061)	(0.0055)	(0.0056)
Factor $_{Al}$	-0.0063	-0.011	-0.036**	0.030***	0.026***	0.021***	0.028***	0.0096**	0.0025	-0.016	-0.013
	(0.012)	(0.012)	(0.014)	(0.0066)	(0.0066)	(0.0041)	(0.0056)	(0.0032)	(0.0014)	(0.012)	(0.012)
Tariff	-0.52***	-0.52***	-0.48***	-0.037**	-0.036**	-0.021**	0.83***	-0.016**	-0.86***	-0.50***	0.35***
	(0.028)	(0.028)	(0.031)	(0.013)	(0.013)	(0.0081)	(0.011)	(0.0058)	(0.0025)	(0.027)	(0.028)
Distance	-0.47***	-0.49***	-0.56***	0.093***	0.077***	0.079***	0.083***	0.014***	0.010***	-0.48***	-0.50***
	(0.0044)	(0.0044)	(0.0050)	(0.0018)	(0.0018)	(0.0012)	(0.0016)	(0.00080)	(0.00034)	(0.0043)	(0.0044)
PTA	0.14***	0.14***	0.18***	-0.033***	-0.032***	-0.030***	-0.029***	-0.0028*	-0.0037***	0.15***	0.15***
	(0.0058)	(0.0058)	(0.0066)	(0.0025)	(0.0025)	(0.0016)	(0.0022)	(0.0011)	(0.00047)	(0.0056)	(0.0058)
WTO	0.17***	0.17***	0.18***	-0.0093**	-0.0097**	-0.018***	-0.0098***	0.0089***	0.00043	0.16***	0.17***
	(0.0064)	(0.0064)	(0.0073)	(0.0030)	(0.0030)	(0.0019)	(0.0025)	(0.0014)	(0.00062)	(0.0062)	(0.0064)
Contiguity	0.35***	0.36***	0.39***	-0.035***	-0.034***	-0.049***	-0.035***	0.015***	0.00020	0.34***	0.36***
	(0.012)	(0.012)	(0.013)	(0.0045)	(0.0045)	(0.0030)	(0.0039)	(0.0020)	(0.00083)	(0.011)	(0.012)
Com. lang.	0.11***	0.11***	0.11***	-0.0074*	-0.0077*	-0.013***	-0.0057	0.0053***	-0.0017**	0.10***	0.11***
	(0.0081)	(0.0081)	(0.0092)	(0.0034)	(0.0034)	(0.0023)	(0.0030)	(0.0015)	(0.00062)	(0.0079)	(0.0081)
Colony	0.24***	0.24***	0.30***	-0.065***	-0.065***	-0.059***	-0.063***	-0.0064**	-0.0025**	0.25***	0.24***
	(0.011)	(0.011)	(0.013)	(0.0046)	(0.0046)	(0.0031)	(0.0040)	(0.0021)	(0.00087)	(0.011)	(0.011)
Same Ctry.	0.18***	0.18***	0.15***	0.035***	0.037***	0.0062	0.026***	0.029***	0.0093***	0.15***	0.17***
	(0.017)	(0.017)	(0.019)	(0.0068)	(0.0068)	(0.0045)	(0.0059)	(0.0030)	(0.0013)	(0.016)	(0.017)
ADP	1.20***	1.19***	1.36***	-0.16***	-0.17***	-0.21***	-0.16***	0.047***	0.0026	1.15***	1.19***
	(0.036)	(0.036)	(0.041)	(0.014)	(0.014)	(0.0098)	(0.012)	(0.0062)	(0.0028)	(0.034)	(0.035)
SPS	-0.038***	-0.039***	-0.015**	-0.022***	-0.024***	-0.012***	-0.020***	-0.010***	-0.0021***	-0.028***	-0.037***
	(0.0051)	(0.0051)	(0.0057)	(0.0023)	(0.0023)	(0.0015)	(0.0020)	(0.0011)	(0.00043)	(0.0049)	(0.0051)
TBT	0.015**	0.012*	0.017**	-0.0018	-0.0048*	-0.0012	-0.0016	-0.00061	-0.00014	0.015***	0.012**
	(0.0046)	(0.0046)	(0.0052)	(0.0021)	(0.0021)	(0.0014)	(0.0018)	(0.00094)	(0.00041)	(0.0044)	(0.0045)
TBTSTC	0.35***	0.34***	0.29***	0.053***	0.046***	0.0012	0.036**	0.052***	0.017***	0.29***	0.32***
	(0.028)	(0.028)	(0.032)	(0.013)	(0.013)	(0.0085)	(0.011)	(0.0063)	(0.0028)	(0.027)	(0.028)
SPSSTC	-0.023	-0.028	-0.091	0.068*	0.063*	0.028	0.060**	0.040**	0.0080	-0.063	-0.036
	(0.066)	(0.066)	(0.073)	(0.028)	(0.027)	(0.016)	(0.023)	(0.014)	(0.0056)	(0.064)	(0.066)
QNTM	-0.067***	-0.064***	-0.034*	-0.033***	-0.030***	-0.013**	-0.030***	-0.020***	-0.0030	-0.047***	-0.061***
	(0.014)	(0.014)	(0.016)	(0.0070)	(0.0070)	(0.0044)	(0.0059)	(0.0034)	(0.0016)	(0.014)	(0.014)
_cons	3.73***	3.65***	9.04***	-5.31***	-5.39***	-2.83***	-4.61***	-2.48***	-0.70***	6.21***	4.35***
	(0.22)	(0.21)	(0.24)	(0.10)	(0.10)	(0.060)	(0.086)	(0.048)	(0.020)	(0.21)	(0.21)
N	3339038	3339038	3339038	3339038	3339038	3339038	3339038	3339038	3339038	3339038	3339038
R^2	0.287	0.290	0.629	0.875	0.874	0.877	0.883	0.890	0.873	0.481	0.330
adj. R^2	0.287	0.290	0.629	0.875	0.874	0.877	0.882	0.890	0.873	0.481	0.330

Table 3.10 – Machinery and transport equipment – SITC 7

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	0.090***	0.057**	-0.057*	0.15***	0.11***	0.063***	0.12***	0.083***	0.023***	0.0066	0.034
	(0.022)	(0.022)	(0.025)	(0.013)	(0.013)	(0.0083)	(0.011)	(0.0059)	(0.0020)	(0.021)	(0.022)
Population $_k$	-0.0060	-0.083*	0.35***	-0.36***	-0.44***	-0.27***	-0.32***	-0.093***	-0.043***	0.087**	-0.040
	(0.034)	(0.034)	(0.040)	(0.020)	(0.020)	(0.013)	(0.018)	(0.0093)	(0.0032)	(0.033)	(0.034)
GDP pc $_j$	0.061***	0.084***	-0.016	0.077***	0.10***	0.082***	0.078***	-0.0052	-0.00091	0.066***	0.085***
	(0.014)	(0.014)	(0.017)	(0.0084)	(0.0084)	(0.0055)	(0.0076)	(0.0040)	(0.0013)	(0.014)	(0.014)
GDP pc $_k$	0.67***	0.66***	0.56***	0.11***	0.096***	0.0058	0.080***	0.10***	0.027***	0.57***	0.63***
	(0.017)	(0.017)	(0.020)	(0.0098)	(0.0098)	(0.0065)	(0.0088)	(0.0046)	(0.0015)	(0.016)	(0.017)
Factor $_K$	-0.17***	-0.16***	-0.18***	0.013***	0.019***	0.026***	0.017***	-0.012***	-0.0034***	-0.16***	-0.16***
	(0.0056)	(0.0056)	(0.0065)	(0.0033)	(0.0033)	(0.0021)	(0.0029)	(0.0015)	(0.00050)	(0.0054)	(0.0056)
Factor $_{Al}$	-0.12***	-0.12***	-0.17***	0.052***	0.054***	0.047***	0.050***	0.0052	0.0022*	-0.12***	-0.12***
	(0.013)	(0.013)	(0.015)	(0.0075)	(0.0075)	(0.0050)	(0.0067)	(0.0035)	(0.0011)	(0.012)	(0.013)
Tariff	-0.89***	-0.90***	-0.89***	-0.0025	-0.0084	0.012	0.90***	-0.015*	-0.90***	-0.88***	0.000056
	(0.029)	(0.029)	(0.033)	(0.014)	(0.014)	(0.0090)	(0.012)	(0.0061)	(0.0020)	(0.028)	(0.029)
Distance	-0.50***	-0.49***	-0.61***	0.12***	0.12***	0.10***	0.11***	0.013***	0.0071***	-0.51***	-0.50***
	(0.0041)	(0.0041)	(0.0046)	(0.0019)	(0.0019)	(0.0013)	(0.0018)	(0.00083)	(0.00026)	(0.0040)	(0.0041)
PTA	0.14***	0.14***	0.18***	-0.049***	-0.048***	-0.038***	-0.043***	-0.011***	-0.0057***	0.15***	0.14***
	(0.0054)	(0.0054)	(0.0061)	(0.0027)	(0.0027)	(0.0018)	(0.0025)	(0.0012)	(0.00037)	(0.0052)	(0.0053)
WTO	0.35***	0.34***	0.36***	-0.013***	-0.018***	-0.036***	-0.017***	0.023***	0.0044***	0.32***	0.34***
	(0.0063)	(0.0063)	(0.0073)	(0.0036)	(0.0036)	(0.0024)	(0.0033)	(0.0017)	(0.00055)	(0.0061)	(0.0063)
Contiguity	0.40***	0.39***	0.41***	-0.011*	-0.013*	-0.039***	-0.014**	0.029***	0.0031***	0.37***	0.39***
	(0.012)	(0.012)	(0.013)	(0.0053)	(0.0053)	(0.0036)	(0.0048)	(0.0023)	(0.00070)	(0.011)	(0.012)
Com. lang.	0.18***	0.18***	0.23***	-0.049***	-0.048***	-0.040***	-0.044***	-0.0090***	-0.0048***	0.19***	0.18***
	(0.0076)	(0.0076)	(0.0085)	(0.0036)	(0.0036)	(0.0024)	(0.0033)	(0.0015)	(0.00047)	(0.0073)	(0.0076)
Colony	0.39***	0.39***	0.48***	-0.096***	-0.096***	-0.084***	-0.090***	-0.012***	-0.0063***	0.40***	0.40***
	(0.010)	(0.010)	(0.011)	(0.0048)	(0.0048)	(0.0033)	(0.0044)	(0.0021)	(0.00063)	(0.0097)	(0.010)
Same Ctry.	0.15***	0.15***	0.13***	0.012	0.013	-0.0011	0.0087	0.013***	0.0031**	0.13***	0.14***
	(0.018)	(0.018)	(0.020)	(0.0082)	(0.0082)	(0.0056)	(0.0075)	(0.0036)	(0.0012)	(0.017)	(0.018)
ADP	1.11***	1.14***	1.30***	-0.19***	-0.15***	-0.13***	-0.17***	-0.055***	-0.022***	1.16***	1.17***
	(0.052)	(0.052)	(0.058)	(0.023)	(0.023)	(0.015)	(0.021)	(0.011)	(0.0034)	(0.050)	(0.052)
SPS	-0.041***	-0.043***	-0.039***	-0.0014	-0.0042	0.0016	-0.00098	-0.0030*	-0.00045	-0.038***	-0.043***
	(0.0053)	(0.0053)	(0.0060)	(0.0028)	(0.0028)	(0.0020)	(0.0026)	(0.0012)	(0.00036)	(0.0051)	(0.0053)
TBT	-0.021***	-0.021***	-0.035***	0.014***	0.014***	0.012***	0.014***	0.0014	0.000017	-0.022***	-0.021***
	(0.0037)	(0.0037)	(0.0041)	(0.0017)	(0.0017)	(0.0012)	(0.0016)	(0.00080)	(0.00025)	(0.0036)	(0.0037)
TBTSTC	0.65***	0.65***	0.63***	0.020*	0.020*	-0.020***	0.017*	0.039***	0.0032*	0.61***	0.65***
	(0.017)	(0.017)	(0.019)	(0.0088)	(0.0088)	(0.0058)	(0.0079)	(0.0042)	(0.0014)	(0.017)	(0.017)
SPSSTC	-2.48*	-2.27	-2.91*	0.43	0.64	0.58**	0.43	-0.15	0.00082	-2.33	-2.27
	(1.21)	(1.30)	(1.26)	(0.27)	(0.33)	(0.22)	(0.27)	(0.085)	(0.040)	(1.22)	(1.34)
QNTM	0.0031	-0.0096	-0.014	0.017*	0.0044	0.0027	0.016*	0.014***	0.0014	-0.011	-0.011
	(0.012)	(0.012)	(0.014)	(0.0073)	(0.0073)	(0.0048)	(0.0066)	(0.0034)	(0.0011)	(0.012)	(0.012)
_cons	1.99***	2.09***	6.24***	-4.25***	-4.15***	-2.15***	-3.82***	-2.10***	-0.43***	4.09***	2.51***
	(0.15)	(0.15)	(0.18)	(0.096)	(0.096)	(0.064)	(0.086)	(0.042)	(0.014)	(0.15)	(0.15)
N	3851572	3851572	3851572	3851572	3851572	3851572	3851572	3851572	3851572	3851572	3851572
R^2	0.362	0.368	0.718	0.893	0.887	0.883	0.896	0.859	0.820	0.499	0.377
adj. R^2	0.362	0.368	0.718	0.893	0.887	0.883	0.896	0.859	0.820	0.499	0.377

Table 3.11 – Miscellaneous manufactured articles – SITC 8

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	0.027	-0.00047	0.018	0.0084	-0.019	0.0035	0.013	0.0049	-0.0050	0.022	0.0045
	(0.026)	(0.027)	(0.031)	(0.016)	(0.016)	(0.010)	(0.014)	(0.0077)	(0.0031)	(0.026)	(0.026)
Population $_k$	0.19***	0.16***	0.26***	-0.072**	-0.10***	-0.12***	-0.10***	0.051***	0.031***	0.14**	0.13**
	(0.045)	(0.045)	(0.052)	(0.025)	(0.025)	(0.015)	(0.022)	(0.012)	(0.0046)	(0.045)	(0.045)
GDP pc $_j$	0.073***	0.092***	-0.074***	0.15***	0.17***	0.13***	0.15***	0.019***	-0.0021	0.053**	0.095***
	(0.018)	(0.018)	(0.020)	(0.010)	(0.010)	(0.0066)	(0.0093)	(0.0049)	(0.0019)	(0.017)	(0.018)
GDP pc $_k$	0.50***	0.49***	0.49***	0.011	0.0026	-0.073***	-0.024*	0.084***	0.035***	0.42***	0.46***
	(0.020)	(0.020)	(0.023)	(0.011)	(0.011)	(0.0071)	(0.010)	(0.0055)	(0.0021)	(0.020)	(0.020)
Factor $_K$	-0.076***	-0.071***	-0.079***	0.0032	0.0078	0.014***	0.0072*	-0.010***	-0.0041***	-0.065***	-0.067***
	(0.0071)	(0.0071)	(0.0082)	(0.0041)	(0.0041)	(0.0026)	(0.0037)	(0.0019)	(0.00075)	(0.0070)	(0.0071)
Factor $_{Al}$	-0.11***	-0.11***	-0.19***	0.084***	0.083***	0.074***	0.086***	0.010*	-0.0024	-0.12***	-0.11***
	(0.016)	(0.016)	(0.018)	(0.0091)	(0.0090)	(0.0058)	(0.0082)	(0.0044)	(0.0016)	(0.015)	(0.016)
Tariff	-0.70***	-0.74***	-0.75***	0.049**	0.011	0.046***	0.93***	0.0026	-0.88***	-0.71***	0.14***
	(0.031)	(0.031)	(0.036)	(0.016)	(0.016)	(0.010)	(0.015)	(0.0078)	(0.0029)	(0.031)	(0.031)
Distance	-0.50***	-0.51***	-0.64***	0.13***	0.13***	0.10***	0.12***	0.030***	0.0096***	-0.53***	-0.52***
	(0.0052)	(0.0052)	(0.0058)	(0.0024)	(0.0024)	(0.0015)	(0.0022)	(0.0011)	(0.00040)	(0.0051)	(0.0052)
PTA	0.11***	0.11***	0.16***	-0.047***	-0.049***	-0.037***	-0.043***	-0.0092***	-0.0034***	0.12***	0.11***
	(0.0069)	(0.0069)	(0.0077)	(0.0033)	(0.0033)	(0.0021)	(0.0030)	(0.0015)	(0.00056)	(0.0068)	(0.0069)
WTO	0.21***	0.21***	0.18***	0.029***	0.030***	-0.0023	0.020***	0.031***	0.0081***	0.18***	0.20***
	(0.0075)	(0.0075)	(0.0086)	(0.0041)	(0.0041)	(0.0026)	(0.0037)	(0.0020)	(0.00077)	(0.0074)	(0.0075)
Contiguity	0.39***	0.39***	0.40***	-0.011	-0.014*	-0.036***	-0.015**	0.025***	0.0041***	0.37***	0.38***
	(0.015)	(0.015)	(0.016)	(0.0063)	(0.0063)	(0.0041)	(0.0057)	(0.0030)	(0.0011)	(0.014)	(0.015)
Com. lang.	0.25***	0.25***	0.28***	-0.028***	-0.027***	-0.030***	-0.027***	0.0021	-0.00070	0.25***	0.25***
	(0.0099)	(0.0099)	(0.011)	(0.0044)	(0.0044)	(0.0028)	(0.0040)	(0.0020)	(0.00073)	(0.0097)	(0.0099)
Colony	0.31***	0.31***	0.41***	-0.098***	-0.099***	-0.078***	-0.090***	-0.020***	-0.0076***	0.33***	0.31***
	(0.014)	(0.014)	(0.015)	(0.0059)	(0.0059)	(0.0039)	(0.0054)	(0.0027)	(0.00095)	(0.014)	(0.014)
Same Ctry.	0.25***	0.25***	0.23***	0.016	0.015	-0.0037	0.0090	0.019***	0.0066***	0.23***	0.24***
	(0.020)	(0.020)	(0.023)	(0.0094)	(0.0094)	(0.0060)	(0.0085)	(0.0045)	(0.0017)	(0.020)	(0.020)
ADP	1.19***	1.25***	1.27***	-0.084**	-0.024	-0.079***	-0.089***	-0.0049	0.0054	1.19***	1.24***
	(0.065)	(0.064)	(0.067)	(0.026)	(0.025)	(0.017)	(0.024)	(0.014)	(0.0045)	(0.062)	(0.064)
SPS	-0.12***	-0.12***	-0.11***	-0.0040	-0.0084**	0.0023	-0.0013	-0.0063***	-0.0027***	-0.11***	-0.12***
	(0.0063)	(0.0064)	(0.0069)	(0.0028)	(0.0028)	(0.0018)	(0.0025)	(0.0013)	(0.00047)	(0.0062)	(0.0063)
TBT	0.070***	0.064***	0.050***	0.020***	0.013***	0.010***	0.020***	0.0095***	0.00037	0.061***	0.063***
	(0.0045)	(0.0045)	(0.0049)	(0.0021)	(0.0021)	(0.0013)	(0.0019)	(0.00098)	(0.00034)	(0.0044)	(0.0045)
TBTSTC	0.57***	0.57***	0.52***	0.050***	0.050***	0.0072	0.040**	0.043***	0.0097***	0.53***	0.57***
	(0.029)	(0.029)	(0.031)	(0.014)	(0.014)	(0.0095)	(0.013)	(0.0068)	(0.0022)	(0.028)	(0.029)
SPSSTC	-0.016	-0.0062	-0.22	0.21**	0.22***	0.083*	0.15**	0.13***	0.056***	-0.14	-0.062
	(0.11)	(0.11)	(0.13)	(0.065)	(0.065)	(0.036)	(0.057)	(0.034)	(0.016)	(0.11)	(0.11)
QNTM	-0.091***	-0.11***	-0.057***	-0.034***	-0.050***	-0.022***	-0.033***	-0.012**	-0.00089	-0.079***	-0.11***
	(0.015)	(0.015)	(0.017)	(0.0086)	(0.0088)	(0.0059)	(0.0080)	(0.0040)	(0.0015)	(0.015)	(0.015)
_cons	2.62***	2.63***	8.88***	-6.26***	-6.25***	-3.00***	-5.49***	-3.26***	-0.78***	5.87***	3.40***
	(0.22)	(0.22)	(0.33)	(0.18)	(0.18)	(0.14)	(0.17)	(0.060)	(0.020)	(0.23)	(0.22)
N	2200702	2200702	2200702	2200702	2200702	2200702	2200702	2200702	2200702	2200702	2200702
R^2	0.358	0.362	0.545	0.759	0.763	0.754	0.757	0.836	0.883	0.482	0.382
adj. R^2	0.357	0.362	0.545	0.759	0.763	0.754	0.757	0.835	0.883	0.482	0.382

Table 3.12 – Commodities and transactions not classified elsewhere – SITC 9

	v_cif	v_fob	Q	uv_cif	uv_fob	q_cif	q_fob	qa_p_cif	qa_p_fob	qa_Q_cif	qa_Q_fob
Population $_j$	1.11***	1.14***	1.34***	-0.24	-0.20	-0.099	-0.28*	-0.14	0.041	1.24***	1.10***
	(0.27)	(0.27)	(0.31)	(0.16)	(0.16)	(0.097)	(0.14)	(0.076)	(0.031)	(0.26)	(0.27)
Population $_k$	2.06***	2.03***	1.09**	0.97***	0.94***	0.39**	0.92***	0.58***	0.057	1.49***	1.97***
	(0.38)	(0.37)	(0.40)	(0.19)	(0.19)	(0.12)	(0.17)	(0.086)	(0.037)	(0.36)	(0.37)
GDP pc $_j$	0.23	0.22	0.12	0.11	0.10	0.11	0.10	0.0025	0.0053	0.22	0.21
	(0.18)	(0.18)	(0.19)	(0.096)	(0.095)	(0.058)	(0.083)	(0.047)	(0.019)	(0.17)	(0.18)
GDP pc $_k$	0.18	0.17	-0.10	0.29**	0.27**	0.092	0.25**	0.20***	0.037	-0.012	0.13
	(0.20)	(0.19)	(0.21)	(0.10)	(0.10)	(0.064)	(0.089)	(0.048)	(0.020)	(0.19)	(0.19)
Factor $_K$	-0.35***	-0.35***	-0.39***	0.038	0.043	0.060**	0.053	-0.022	-0.015*	-0.33***	-0.33***
	(0.068)	(0.068)	(0.075)	(0.036)	(0.036)	(0.022)	(0.031)	(0.017)	(0.0070)	(0.066)	(0.067)
Factor $_{Al}$	0.24	0.24	0.32	-0.079	-0.083	-0.012	-0.073	-0.067	-0.0053	0.31*	0.24
	(0.16)	(0.16)	(0.17)	(0.083)	(0.082)	(0.051)	(0.071)	(0.039)	(0.016)	(0.15)	(0.16)
Tariff	0.21	0.23	0.048	0.16	0.18	0.17	1.04***	-0.0045	-0.88***	0.21	1.11***
	(0.33)	(0.33)	(0.37)	(0.17)	(0.17)	(0.10)	(0.15)	(0.077)	(0.027)	(0.33)	(0.33)
Distance	-0.27***	-0.29***	-0.42***	0.14***	0.12***	0.10***	0.12***	0.037***	0.020***	-0.31***	-0.31***
	(0.043)	(0.043)	(0.044)	(0.017)	(0.017)	(0.011)	(0.015)	(0.0081)	(0.0033)	(0.041)	(0.042)
PTA	-0.13*	-0.13*	-0.16*	0.022	0.022	0.010	0.012	0.012	0.010*	-0.15*	-0.15*
	(0.062)	(0.062)	(0.065)	(0.025)	(0.025)	(0.016)	(0.022)	(0.011)	(0.0046)	(0.060)	(0.062)
WTO	0.071	0.060	0.039	0.032	0.021	-0.0035	0.022	0.035	0.0099	0.035	0.050
	(0.069)	(0.069)	(0.076)	(0.038)	(0.037)	(0.023)	(0.032)	(0.018)	(0.0077)	(0.066)	(0.068)
Contiguity	0.59***	0.59***	0.55***	0.036	0.034	-0.0040	0.028	0.040	0.0084	0.55***	0.58***
	(0.12)	(0.12)	(0.13)	(0.048)	(0.048)	(0.030)	(0.043)	(0.023)	(0.0079)	(0.12)	(0.12)
Com. lang.	-0.028	-0.029	-0.013	-0.015	-0.016	0.0020	-0.0073	-0.017	-0.0074	-0.011	-0.022
	(0.078)	(0.078)	(0.083)	(0.030)	(0.030)	(0.019)	(0.026)	(0.014)	(0.0052)	(0.077)	(0.078)
Colony	0.20*	0.19*	0.27**	-0.069	-0.079	-0.056*	-0.074*	-0.013	0.0056	0.21*	0.18*
	(0.094)	(0.093)	(0.10)	(0.042)	(0.042)	(0.027)	(0.037)	(0.020)	(0.0071)	(0.092)	(0.093)
Same Ctry.	-0.23	-0.23	-0.24	0.0096	0.0065	-0.017	0.00043	0.026	0.0092	-0.25	-0.24
	(0.15)	(0.15)	(0.17)	(0.069)	(0.068)	(0.042)	(0.059)	(0.033)	(0.014)	(0.15)	(0.15)
ADP	-0.88**	-0.87**	-1.35	0.47	0.47	0.52	0.50	-0.051	-0.026	-0.83	-0.85*
	(0.34)	(0.33)	(0.98)	(0.84)	(0.86)	(0.52)	(0.74)	(0.32)	(0.12)	(0.52)	(0.37)
SPS	-0.0012	-0.0013	-0.065*	0.064***	0.064***	0.039***	0.054***	0.025***	0.0095***	-0.026	-0.011
	(0.027)	(0.027)	(0.031)	(0.014)	(0.014)	(0.0097)	(0.013)	(0.0066)	(0.0026)	(0.026)	(0.027)
TBT	0.0047	-0.0076	-0.035	0.040*	0.027	0.011	0.024	0.029***	0.016***	-0.024	-0.023
	(0.028)	(0.028)	(0.032)	(0.017)	(0.017)	(0.011)	(0.015)	(0.0075)	(0.0030)	(0.026)	(0.028)
TBTSTC	0.089	0.056	0.12	-0.031	-0.063	-0.060	-0.033	0.029	0.0015	0.060	0.055
	(0.19)	(0.19)	(0.21)	(0.12)	(0.12)	(0.077)	(0.11)	(0.054)	(0.019)	(0.17)	(0.18)
SPSSTC	0.65***	0.52**	0.47*	0.18	0.051	-0.038	0.11	0.22***	0.070**	0.43**	0.45**
	(0.17)	(0.17)	(0.18)	(0.11)	(0.11)	(0.069)	(0.092)	(0.055)	(0.022)	(0.15)	(0.16)
QNTM	-0.20*	-0.22*	0.18	-0.38***	-0.40***	-0.25***	-0.36***	-0.13***	-0.021*	-0.066	-0.19
	(0.10)	(0.10)	(0.11)	(0.061)	(0.061)	(0.037)	(0.054)	(0.027)	(0.0087)	(0.098)	(0.10)
_cons	-4.36**	-3.96**	2.55	-6.91***	-6.52***	-3.38***	-6.09***	-3.53***	-0.82**	-0.83	-3.14*
	(1.48)	(1.49)	(1.62)	(0.93)	(0.96)	(0.51)	(0.73)	(0.50)	(0.29)	(1.41)	(1.45)
N	39249	39249	39249	39249	39249	39249	39249	39249	39249	39249	39249
R^2	0.336	0.350	0.544	0.886	0.894	0.880	0.891	0.860	0.801	0.309	0.325
adj. R^2	0.330	0.344	0.539	0.885	0.893	0.879	0.890	0.859	0.799	0.303	0.319

4. Technical Barriers to Trade Notifications and Dispute Settlement within the WTO

Abstract: The aim of this paper is to verify to what extent and in which circumstances TBT notifications can serve as an early warning system for future disputes in the area of TBTs. From 1995-2011, there were 45 requests for consultation under the Dispute Settlement (DS) Body of the World Trade Organization (WTO) in order to identify violations of the technical barriers to trade (TBT) agreement. The DS Body's decisions regarding violations of the TBT agreement will be discussed in this paper. WTO members, in order to increase transparency in trade policy, have made efforts to compile data on notified TBTs. The WTO provides a TBT dataset that covers the Specific Trade Concerns (STCs) raised by its members. This paper attempts to find the linkages between DS cases citing the TBT agreement and the STC data. We will analyze, descriptively and econometrically, the relationship between raising TBT STCs and DS cases on TBTs.

4.1. Introduction

Eight Multilateral Rounds of Trade negations under the GATT contributed significantly to the reduction of import tariffs among World Trade Organization (WTO) members. However, non-tariff measures (NTMs) have become relatively more important and have raised global attention. For example, the Multi-Agency Support Team (MAST)[29] described NTMs as follows: "Non-tariff measures (NTMs) are policy measures, other than ordinary customs tariffs, that can potentially have an economic effect on international trade in goods, changing quantities traded, or prices or both." (MAST, 2008).

According to the latest classification by the World Integrated Trade Solution (WITS) in February 2012, NTMs include 16 categories. The first and second categories are the most frequently notified by WTO members, which are sanitary and phytosanitary (SPS) measures, and technical barriers to trade (TBT). According to WITS, TBTs are "measures referring to technical regulations, and procedures for assessment of conformity with technical regulations and standards, excluding measures covered by the SPS Agreement."

The general aim of the TBT agreement, concluded during the Uruguay Round, is to ensure that technical regulations and standards, as well as testing and certification procedures, do not create unnecessary obstacles to international trade. However, it is recognized that countries have the right to establish protection, at levels they consider appropriate, for example, for human, animal

[29] The MAST group, as of July 2008, comprises of the following institutional members: the Food and Agriculture Organization of the United Nations (FAO), the International Monetary Fund (IMF), the International Trade Centre UNCTAD/WTO (ITC), the Organization for Economic Cooperation and Development (OECD/TAD), the United Nations Conference on Trade and Development (UNCTAD), the United Nations Industrial Development Organization (UNIDO), the World Bank (WB), and the World Trade Organization (WTO). Observers: the European Commission (EC), the United States International Trade Commission (USITC), and the United States Department of Agriculture (USDA). UNCTAD and the World Bank jointly coordinate the MAST group. The MAST group reports to the Group of Eminent Persons, which is convened by the director general of UNCTAD.

or plant life or for health or environmental protection. Countries should not be prevented from taking the necessary measures to ensure that those levels of protection are met. Therefore, the Agreement encourages countries to use international standards where these are appropriate, but it does not require them to change their levels of protection because of standardization.

As of 31 December 2012, there have been 454 requests for consultations filed under the Dispute Settlement (DS) Understanding. Since 1995, the TBT agreement has been cited in 45 WTO disputes. This is about one tenth of all disputes, showing the real trade significance of TBTs. It is worth mentioning that in the majority of DS cases, multiple agreements are cited. However, according to the WTO report (2012)[30], out of the 393 disputes relating to the trade of goods from 1995-2011, TBTs have been cited in 10.2% of them, which is the fifth agreement in terms of the number of citations.

Thus, there have been 45 requests for consultations to the DS Body citing the TBT agreement. Most of these consultations have been requested because – according to the complainant - the imposed measures have been creating unnecessary obstacles to trade.

Maskus et al. (2000) briefly analyzed DS requests from 1995-2000 citing TBT and SPS agreements. Their analysis focused on the new standards and regulations and their importance for international trade. There are already many studies analyzing the economic implications of some TBT and SPS measures. In some cases, the authors demonstrate the drastic disruption of trade flows resulting from the imposition of "legitimate" higher standards. For example, Otsuki et al. (2001) analyzed the impact of new EU safety aflatoxin standards on the importing of food products from Africa. Their analysis showed that this new regulation decreased the health risk by 1.4 deaths per billion a year, while it reduced imports from African countries by 64%, i.e. about 670 million US dollars. The authors argue that this substance rarely causes death in developed countries. They did not find any conclusive scientific evidence for the relationship between aflatoxicosis and the amount of aflatoxin intake. Their main perception of this more rigorous EU regulation was that the costs imposed on developing countries were much higher than the benefits in the EU.

Aisbett and Pearson (2012) present another interpretation of TBT and SPS measures. In an empirical analysis, they demonstrated that countries imposing SPS regulations are acting in good faith. They showed that a smaller tariff-binding overhang causes a higher probability of the imposition of new SPS measures. Moreover, they argue, based on econometric results, that high environmental standards, healthcare, and institutional governance qualities are the main factors affecting the imposition of SPS. While other countries facing NTMs perceive them as a protectionism measure, the imposing country is actually imposing them in good faith to protect human health, safety, and other environmental qualities.

The issue of complementarity or substitutability between tariffs and NTMs has been emphasized in the literature. Ray (1981) found a causal relationship from tariffs to NTMs in the US, meaning that NTMs are supplements for tariffs. Yu (2000) provided a theoretical framework to show the substitutability of NTMs for tariffs. Kono (2006) showed that most

[30] Table C.4 of the report, page 111.

democratic countries try to implement opaque and complex NTMs, instead of simple tariffs, in order to hide their policies from the public. Feinberg and Reynolds (2007) confirmed the substitutability of tariffs with antidumping measures. They found that tariff reductions after the WTO agreement, from 1995-2004, increased the likelihood of usage of antidumping protection by governments. Moreover, their results suggested that a reduction of tariffs increased the number of petitions for this NTM measure filed by WTO member states. The results of Moore and Zanardi (2011) suggested the substitution of antidumping for tariff reductions only in the developing countries that have become heavy users of this NTM measure.

A literature review on standardization effects was done by Swann (2010). Based on many econometric studies, he argues that the use of international standards in a given country usually increases exports from and imports into that country. On the other hand, the use of national standards in a given country increases its exports, but the implications for imports into that country are less clear. In some cases, standards can facilitate imports, but in other cases, standards restrict such imports. In the case of sanitary and phytosanitary (SPS) measures, national standards are more likely to restrict imports; especially those from developing countries. The complex nature of TBTs does not always allow one to find the true motivation behind their implementation. Despite the declared, official motivation and consequent trade effects of TBTs, it is not always possible to prove whether or not they are in accordance with the TBT agreement. Swinnen and Vandemoortele (2012) also reviewed the political and economic literature on standards. They exclusively categorized standards as barriers or catalysts to trade: barriers in the sense that some regulations might root from the special interest groups protecting domestic industries and causing trade prohibitions; and catalysts to trade pursuing the protection of consumers within a society, or reducing the information costs of the market, affecting trade positively. However, it is not yet evidently possible to distinguish between these two motives through the opaque nature of TBT and SPS.

Recent efforts by international organizations to provide databases on these measures have improved the transparency of NTMs. Santana and Jackson (2012) reviewed the inventories and instruments to identify the issues affecting trade such as NTMs. They found GATT and WTO disputes as proxies of NTMs in order to forecast their future impositions. The Specific Trade Concern (STC) database, compiled by the WTO secretariat, is one of the most important instruments in increasing trade policy transparency.

In this chapter, we will analyze the STC database and will try to find a possible relationship between the DSs held on TBTs and STCs. In particular, we will verify whether or not TBT notifications can serve as an early warning system for future disputes involving the TBT agreement. The structure of this paper is as follows: in the next section, we will elaborate on the importance of transparency issues in WTO agreements. In the third section, a detailed description of TBT and STC data will be provided. The fourth section describes the relationship between the DSs and the TBT data. In the fifth section, we will provide an econometric analysis to find the linkages between raised TBT STCs and DS cases citing the TBT agreement. Finally, in the fifth section, the conclusions will be presented.

4.2. Transparency in the imposition of TBT

The Preamble to the TBT agreement states: "no country should be prevented from taking measures necessary to ensure the quality of its exports, or for the protection of human, animal, and plant life or health, of the environment, or for the prevention of deceptive practices, at the levels it considers appropriate." However, "Members shall ensure that technical regulations are not prepared, adopted, or applied with a view to, or with the effect of, creating unnecessary obstacles to trade." (Article 2.2).[31] Therefore, flexibility in introducing restrictive TBT measures is - in principle - limited. Technical standards are often introduced to protect the interests of consumers (for health, safety or environmental reasons etc.), but they can also restrict the volume of international trade, as foreign suppliers might not be able to comply with the country's regulatory framework. Such restrictions on foreign competition may decrease welfare by allowing domestic firms to charge higher prices and by reducing the volume of trade.

In principle, unnecessary obstacles to trade can result when (i) a regulation is more restrictive than necessary to achieve a given policy objective, or (ii) when it does not fulfill a legitimate objective. A regulation is more restrictive than necessary when the objective pursued can be achieved through alternative measures, which have less trade-restricting effects, taking into account the risks non-fulfillment of the objective would create.[32] The obligation to avoid unnecessary obstacles to trade also applies to conformity assessment procedures (Article 5.1.2). An unnecessary obstacle to trade could result from stricter or more time-consuming procedures than are necessary to assess that a product complies with the domestic laws and regulations of the importing country.

There can be three main arguments for the imposition of regulatory measures. Firstly, TBT can serve as an instrument of public policy aiming at the protection of human health or safety, animal or plant life or health, or the environment. Secondly, from an economic point of view, TBT might focus on the increase of social welfare, in the case of market failures, without the implementation of discriminations in trade. For instance, mandatory labelling of products, a sub-category of TBT, will provide better information to consumers and other suppliers in the market, which can improve the efficiency of the market. Consequently, this will lead to a rise in social welfare, while it might incur some costs to the supplier facing the regulation. Thirdly, a TBT measure can be caused by a political economy motivation, i.e., it can create an unnecessary obstacle to trade in order to protect special domestic interest groups, and potentially reduce social welfare. The first two reasons are expressions of good faith by governments and are accepted by the TBT agreement. The last approach hampers trade and violates the articles of TBT, SPS, and other agreements made by the WTO.

In developed countries, almost all tariff lines are bound within the schedules of concessions and duties and cannot be raised to increase the level of protection. On the other hand, higher technical standards can be implemented, and in this manner, they might protect the domestic industry capable of meeting higher standards, relative to foreign industries. However,

[31] The results of the Uruguay Round (1994), the TBT agreement, page 139. All other citations of the TBT agreement come from the same source.
[32] Articles 2.3 and 2.4 of the TBT Agreement.

sometimes it is difficult to find out whether or not a given TBT is in line with the TBT agreement. In other words, neither the aims of the TBT declared by the imposing governments, nor its trade effects, can provide a conclusive legal judgment. It is worth adding that according to WTO regulations, governments should be transparent in all of the trade policies that they impose. It can happen that governments might satisfy the special interest of lobbying groups by concealing the protectionist policy instruments behind TBTs. In order to realize the trade discriminative characteristics of these policies, thorough analyzes should be carried out.

Asymmetric information is one of the major causes of market imperfections. According to Geraats (2002), transparency decreases the asymmetry of information in the market. Thus, the efficiency of the international market can also be increased due to the symmetry of information. TBT and SPS Agreements explicitly require a high level of transparency and require that member states shall set up "enquiry points" providing information on technical regulations. WTO Members should also notify any new technical regulation, standards, and conformity assessment procedures to the WTO Secretariat. They should also inform the Secretariat about any international agreements involving these issues. The number of relevant notifications is several hundred each year, and about 25% of them are conducted by the European Union.

The TBT agreement explicitly encourages Members to use existing "international standards or relevant parts of them" for their national regulations, unless "their use would be ineffective or inappropriate" to fulfill a given policy objective. Technical regulations, in accordance with relevant international standards, "shall be rebuttably presumed not to create an unnecessary obstacle to international trade" (Article 2.5). Similar provisions apply to conformity assessment procedures: international guides or recommendations issued by international standardizing bodies, are to be used in national procedures for conformity assessment unless they are "inappropriate for the Members concerned, inter alia, such reasons as national security requirements, … protection of human health or safety, animal or plant life or health, or protection of the environment, … fundamental technological or infrastructural problems"[33].

Thus, the concept of transparency is well defined in the TBT agreement and is one of the key principles governing the WTO system[34]. "WTO agreements also include multiple provisions aimed at improving the transparency of policy measures affecting trade. These provisions can be grouped into the following four categories: (a) publication requirements; (b) notification requirements; (c) the Trade Policy Review Mechanism and the monitoring reports; (d) the possibility of raising specific trade concerns (STC) in the SPS and TBT committees and in the dispute settlement mechanism (DSM)."[35] These provisions increase the transparency of TBTs maintained by member states. However, governments pursuing political economy goals, aimed at supporting interest groups, can be reluctant to notify new measures. In such cases, WTO regulations allow member states to raise specific trade concerns on the measures maintained by

[33] Article 5.4.

[34] The concept of transparency can have many attributes when applied to policy measures. According to Geraats (2002), transparency should be completed by the following steps: 1- ensuring the openness of policy; 2- references to economic, scientific, and technical aspects; 3- procedural and implementation transparencies; 4- publications and notifications of policy. In general, articles of GATT and TBT agreements oblige members to carry out all of these steps for the imposition of NTMs.

[35] World Trade Report 2012, page 96.

other countries. For example, exporters facing new obstacles to trade usually inform their government and ask for support within the framework of the WTO. Thus, even if a TBT measure is notified by a WTO member, other countries can raise concerns on those TBTs. In fact, STCs for TBT are a subset of all TBTs maintained by all WTO members. The WTO has - in order to increase transparency - constructed a database on STCs of TBTs and SPSs. The STC features are presented in the next section.

4.3. Technical issues of the TBT dataset of STC

The WTO, World Bank and United Nations Conference on Trade and Development (UNCTAD) have recently combined their efforts to compile data on NTMs, and especially on TBTs and SPSs. This dataset should help governments and industries to be informed about measures applied to international markets and, thus, should increase transparency and reduce market imperfections.

WTO members can discuss issues related to specific measures imposed by other members at the meetings of the TBT and SPS committees. The STCs are "reverse notifications" that inform the WTO secretariat about other members' "concerns" regarding notified measures. The WTO Secretariat has compiled the data for all of the concerns related to TBT and SPS from 1995 to 2011[36]. We chose to focus our attention on the TBTs included in the TBT dataset of STCs. The data has been compiled from two sources: TBT Committee minutes that cover STCs and WTO notifications, which include all direct notifications made by imposing countries. When the information from both sources is not equivalent, the one from the TBT Committee's minutes is preferred and included in the dataset. This data contains 12,426 observations[37] for 317[38] notifications over various types of products (tariff lines at a two to six-digit level of the Harmonized System revision 2). All 317 STCs are treated as the first (original) source, and only 251 of them are included in the WTO notifications (secondary source). In fact, for 66 cases, countries imposing TBT were reluctant to notify the WTO and their trade partners informed the WTO instead. Some data on products, where concerns were not raised but the measure was imposed, was not listed on the database. In other words, the STC data covers products where the concern was raised and not the products on which the TBTs were introduced. Therefore, it does not cover all TBT measures, but only those related to STCs. Thus, the TBTs imposed in line with the TBT agreement, and not creating unnecessary obstacles to trade, are presumably not included in the STC database.

The number of observations for each STC can show how many products are covered by the notified TBT. This can be used as an indicator of TBT trade coverage. For example, the STC

[36] The data is available at: http://www.wto.org/english/res_e/publications_e/wtr12_dataset_e.htm.

[37] Each observation refers to a row on the database, which represents the product in the focus of the STC raised by various countries (concerned ones) for a specific TBT imposed by another (maintaining) country. Each observation also covers different information such as the dates the STC was raised, notification numbers and symbols, the classification of the TBT, and some other descriptive issues from the minutes recording.

[38] The data shows 318 STCs, however, item 220 is missing from the data; thus, there exists only 317 STCs. Item number 220 also does not exist in the TBT Information Management System of the WTO. According to the description of the STC data, item 220 has been deleted because it was a duplication of item no. 219.

item number 88 includes a huge number of products. Under this STC, 1,424 observations cover 178 chemicals and goods using chemicals products (at a four-digit level of HS2). Each product is in fact repeated 8 times and the main characteristics are the same, except for the STC notification type symbol and the notification number (provided by the WTO notification source). In other words, under this item, there are 8 STC symbols and 3 notification numbers for each product, and all the other things, like the TBT Committee minutes' description, are similar. It means that, in this case, several countries raised concerns on the same measures several times. Thus, we have to bear in mind that, in this case, all of the concerned WTO members are listed in 8 separate observations, for each product. This is a serious disadvantage for the STC dataset as it repeats similar concerns (observations) from different sources, which makes the whole database artificially large and less suited for comparisons. We should also mention that different STC symbols and notification numbers can, in principle, be fitted into one observation of each product when all of the concerned members are also fitted into one observation.

Table 4.1 – Sample of item number 88 of the STC data for product code 2801

1	2	3	4	5
Item No.	**STC Notif Type Symbol 2**	**STC Notif Type Symbol**	**NOTIF_NO**	**HS Code (Rev. 2)**
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/52	40090	2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/52/Rev.1		2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/295	92925	2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/297	93368	2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/333		2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/334		2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/335		2801
88	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6	G/TBT/N/EEC/336		2801
Correction	G/TBT/N/EEC/52 and Adds.1-5; Add.3/Rev.1; G/TBT/N/EEC/295 and Add.1; G/TBT/N/EEC/297; G/TBT/N/EEC/333-6		40090, 92925, 93368	2801

Source: STC database on TBT and own corrections in the last row.

Table 4.1 shows the example of item number 88 of the STC database. This item covers only Fluorine, chlorine, bromine and iodine products (HS code no. 2801) among the other 177 products covered by item 88. Out of the 29 columns of STC data, only 5 columns have been presented in this table. As can be observed, three columns (i.e. Item No., STC Notif Type Symbol 2 and HS Code (Rev. 2)) are exactly the same, while there are only differences in the third and fourth columns. In fact, only two columns, out of all of the 29 columns in the STC data, are not similar. That is why there are 8 observations for one product in this item[39]. Because of this monotonous repetition, the STC data is not very well suited for economic analysis. However, if all of the data is corrected in a simple way, as it is shown in the sample of item number 88, the quality of the data can be higher, as each observation would only focus on the product on which the concern is raised.

As was already mentioned, item no. 88 is one of the most important STCs as it covers a large number of products. Since 20 March 2003, concern about this item has been raised 29 times by 34 countries. In this case, the European Communities are maintaining Regulation on the Registration, Evaluation and Authorization of Chemicals (REACH). The main concerns for other WTO members on this item regard: discrimination, further information, clarification, international standards, text, rationale, legitimacy, special and differential treatment, technical assistance, time to adapt, reasonable intervals, transparency, and unnecessary barriers to trade.

Table 4.2 shows the top 10 countries (and groups of countries) maintaining TBT for which STCs were raised by other members most frequently (the full list of countries can be found in the Appendix, table 7). Among 43 groups of countries with STC on TBTs, the leaders were the European Union (EU), including its 27 members, with 3138 observations covering 64 STCs, China with 1366 observations covering 39 STCs, and the United States with 1083 observations covering 35 STCs raised by others. According to the complete list (see the appendix), developing countries are at the bottom of the list. The World Trade Report (2012) comes to the same conclusion for countries raising concerns. Thus, developed countries are participating in the STC mechanism more frequently than developing countries in terms of maintaining or raising STCs. The econometric analysis in the 2012 Report shows that the trade coverage under these concerns is higher for developed countries rather than for developing ones. Moreover, the WTO Report states that developing countries are gradually increasing their participation in both activities.

When analyzing the product coverage of STC, we shall note that "Undenatured ethyl alcohol of an alcoholic strength by volume of less than 80 % vol.; spirits, liqueurs and other spirituous beverages" (HS Code 2208), with 126 observations, is the most frequent STC in the dataset. Since there are many products at a four-digit level, below the aggregated products are studied at a two-digit level.

[39] It is possible to simply correct the data and remove the duplications for such a problem as represented in table 1. First, all of the different rows in the third and fourth columns can be summarized and fitted within one row (the same as what we have in the shaded row at the bottom of table 1). Then, duplicated rows (white rows) need to be removed, and finally, the last row with one observation will remain.

Table 4.2 – 10 top countries (groups of countries) - respondents of STCs raised by other members

No	Member Maintaining	No. Obs.	No. STCs	No	Member Maintaining	No. Obs.	No. STCs
1	European Union	3138	64	**6**	Brazil	635	18
2	China	1366	39	**7**	Japan	198	11
3	United States	1083	35	**8**	Indonesia	613	10
4	Korea, Republic of	698	25	**9**	Mexico	509	9
5	India	642	18	**10**	Canada	177	9

Source: Own calculations from the STC database.

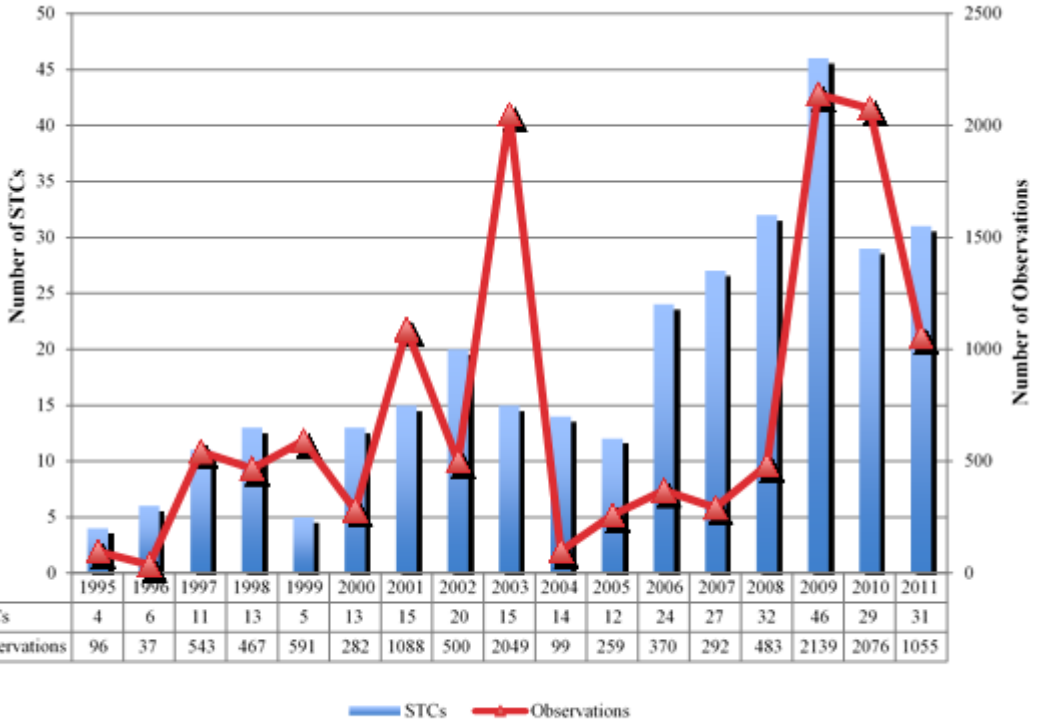
Table 4.3 shows the 10 most frequent products at a two-digit level of HS2 on which STCs were raised. The complete table, covering all of the products on which STCs were raised, is illustrated in table 8 of the appendix. The order of the numbering of the groups of products is according to the decreasing number of STCs and then the number of observations in the data. Beverages, Spirits and Vinegar products with code 22, at a two-digit level, are the most frequent products under the focus of STCs, which have been mentioned in the dataset 543 times.

Table 4.3 – 10 most frequent products at a 2-digit of HS 2 level in the focus of STCs

Rank	Codes	N. STC	N. Obs.	Rank	Codes	N. STC	N. Obs.
1	22	57	543	6	3	36	290
2	85	41	428	7	21	34	224
3	2	40	480	8	19	34	191
4	84	40	291	9	16	34	188
5	4	38	388	10	15	33	770

Source: Own calculations from the STC database.

Figure 4-1 – Trends of STCs and observations in the data raised by members



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
STCs	4	6	11	13	5	13	15	20	15	14	12	24	27	32	46	29	31
Observations	96	37	543	467	591	282	1088	500	2049	99	259	370	292	483	2139	2076	1055

Source: STC database.

Apart from product 22, it can be observed that food, beverages, and agricultural products are not the main issues concerning TBTs, but they make up the majority of the top 10 most frequent products in the focus of TBT STCs. The second product in Table 3, with the HS Code 85, includes "Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles". This shows that STCs are also maintained for technical reasons and not only for health and safety issues. HS-Codes 02, 03, 04, 15, 16, 19, 21 and 22 are food related products as mentioned in the STC data description. HS-Code 84 includes all of the products related to nuclear reactors, boilers, machineries, and some mechanical appliances. Thus, a broad variety of products representing high or low technology can raise concern from WTO members. However, as the bottom of the list in the appendix shows, agricultural products are more in the focus of TBT STCs.

Figure 4-1 presents the trends of STCs (items) and the number of related observations (rows) for each year[40]. It reveals the upward trends of STCs during the periods 1995-1998, 1999-2002, and 2005-2009, while there were sudden or gradual decreases outside of these periods. In general, there was an increasing trend of concerns raised by WTO members. Trends in the number of observations demonstrate a similar pattern to the STC trends, but in some years, this pattern did not coincide. Thus, there is no clear correlation between STCs and the number of

[40] It is worth mentioning that in the SPS STC data provided by the WTO, the dates that the STC cases were resolved were also mentioned, while there is no such information in the TBT STC database. Therefore, some STCs on TBT might have been resolved during those years, but it was not mentioned in the data.

observations, because of frequent repetitions in some STCs. However, despite the data misspecification that is due to multiple inclusions, STCs with a large number of observations in the data can cover a great number of products. This can mean that STCs with great coverage of products have bigger effects on trade.

According to Figure 4-1, there was a sudden increase in the number of STCs and observations after 2008. The recent financial crisis encouraged some governments to impose new NTMs for "emergency" reasons. These TBTs with a large coverage seem to have a protectionist motivation behind them. They can effectively influence imports and they are called "emergency" measures according to the World Trade Report (2012)[41]. In fact, during the recent financial crisis, some governments were probably tempted to impose NTMs such as TBTs to help their domestic enterprises.

4.4. Descriptive Analysis on the Linkages between Dispute Settlements and STCs

A dispute at the WTO starts when a government of a member state believes that another member is violating one of the WTO agreements. The complaining member must identify the violated agreements and request consultation within the DSM. If consultations do not solve the problem, a Member state will request that a panel be set up. Since 1995, 45 cases have cited the TBT agreement in their request for consultation[42]. In this section, we will analyze these disputes and the linkages between them and the TBTs included in the STC.

Table 4.4 – Summaries of DS cases based on their respondents

Respondent	Cases	Resolved	Matched STCs	Cited TBT Art.	Average Length	Max Length
EU Countries	20	14	11	2, 5, 6, 7, 8, 9, 12	4.6	14.6
USA	11	11	7	2, 5, 6, 7, 8, 12, 14	4.4	14.6
Argentina	4	2	1	2, 2.2, 5, 12	2.4	2.6
South Korea	4	4	4	2, 5, 6	3	6.2
Australia	3	0	3	2.1, 2.2	-	-
Mexico	2	1	0	1, 2, 5	2.7	2.7
India	1	0	1	2	-	-
Total	45	32	27	-	4.14 (total average)	

Source: WTO website and the STC database on TBT.

[41] Page 80 of the report.
[42] These disputes are available at the WTO website: http://www.wto.org/english/tratop_e/dispu_e/dispu_agreements_index_e.htm?id=A22#selected_agreement.

Table 4.4 shows the summary of disputes in which the TBT agreement was cited. The disputes were geographically concentrated. Since 1995, only seven groups of countries have been the respondent of forty-five cases of DS, citing violation of the TBT agreement. The European Union (and its 27 members of the WTO), more frequently than any other countries, was the respondent to DSs, 20 times in total. It has already been shown that EU countries were maintaining 64 STCs raised by others, which was the highest record among all members. While China was the second largest country in terms of maintaining TBT STCs, no one requested consultation against China in DSs. Thus, measures maintained by the Chinese government raised STC but did not seemingly violate TBT agreements and provoked no action regarding DS. In fact, the TBT measures implemented by China might have been imposed in good faith and there might have been justifiable motivations behind them.[43]

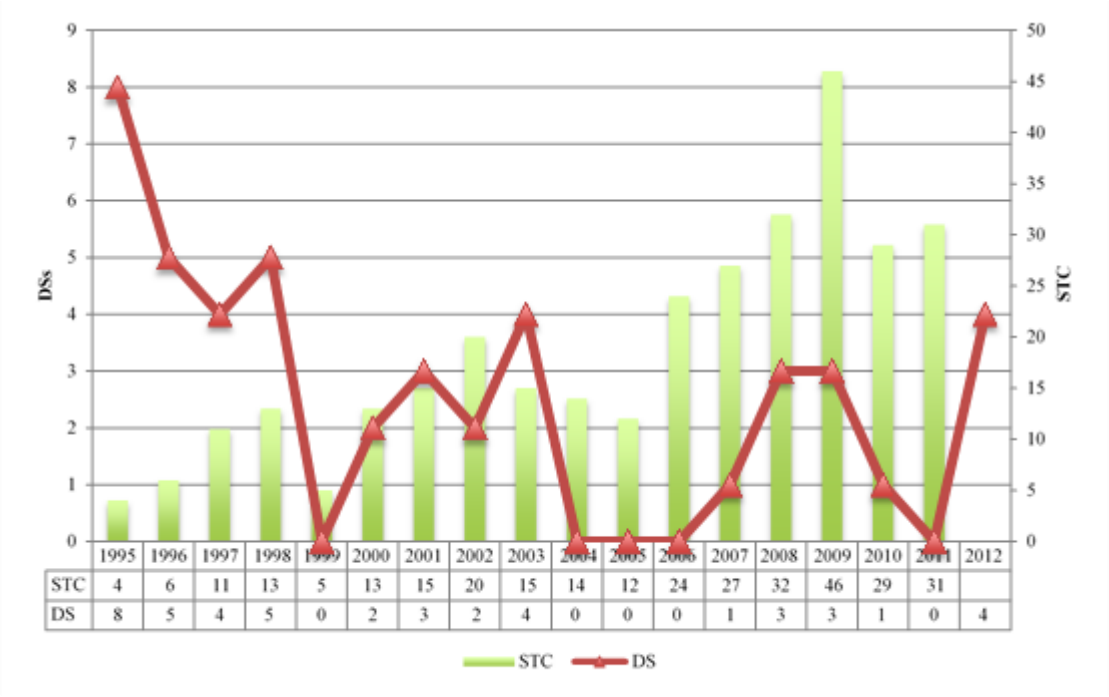
The United States of America is the second highest respondent for DSs totaling 11 cases. South Korea is the fourth country in terms of the imposition of STCs on TBT, and the fourth member respondent for violation of the TBT agreement (four cases). Argentina, Australia, Mexico, and India are the rest of the WTO members responding to violations of the TBT agreement within the DSM. Among all of these 7 groups of countries, Australia maintained the lowest number of TBT STCs in the data.

4.4.1. Matching DS cases with the TBT data

Figure 4-2 shows the trend of raised STCs in bars and that of DS cases in the marked line. Before 1999, these two trends were moving in opposite directions. From 1995-1999, the number of new STCs was gradually increasing, while DS cases were decreasing to zero. In 1999, 2004, 2005, 2006, and 2011, there were no requests for consultation within the DSM citing the TBT agreement. From 1999 until 2011, these two trends followed almost similar patterns. Santana and Jackson (2012) stated that the number of DS cases citing TBT agreements decreased along with all other DS cases during 1995-2011. In order to find the possible explanations of these patterns, the linkages between STCs and DSs on TBT will be analyzed in this subsection.

[43] There might be some reasons explaining this situation: firstly, because China implemented TBT measures on real grounds and on a non-discriminative basis that have had no impact on trade flows; secondly, because China is a very competitive country in the international market, the measures imposed have had no visible effect on imports to China - thus, countries are exporting and are facing relatively minor problems and do not request for DS consultations.

Figure 4-2 – Trends of DSs and TBT STCs



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
STC	4	6	11	13	5	13	15	20	15	14	12	24	27	32	46	29	31	
DS	8	5	4	5	0	2	3	2	4	0	0	0	1	3	3	1	0	4

Source: STC database and the WTO website.

The STCs raised and the DSs initiated do not follow similar patterns during 1995-1998. Some of the DS cases have no "equivalents" in the STC database on TBT. Several explanations are possible: Firstly, the dates on which DS cases have been requested are mostly different from those of the related STCs being raised. In some cases, STCs (e.g. DS144) were raised on a later date; Secondly, a reason for the trends' disparity can be that sometimes an STC is equivalently referring to multiple cases of DS (e.g. item number 304 is related to DS434, DS435, and DS441); Thirdly, sometimes, a reverse case can also be observed when a special case of DS refers to multiple items of STCs (e.g. DS135 is related to items number 12, 22, and 25); Fourthly, some TBT cases of DS are not included in the TBT data but are included in the SPS data (e.g. DS5 and DS20 are related to item number 1 of the SPS STC data; DS3 and DS41 are mentioned in item number 2 of that data); Fifthly, there are many disputes (18 cases) that have not been found in the data or in the online TBT Information Management System of the WTO. They might not have been included in the data or have been suspended afterwards because the complainants have withdrawn their requests (e.g. DS72, DS210, and DS232).

Some TBT complaints in DS cases have been rejected by the DS findings, which mean that there was not sufficient evidence of violations of the TBT agreement. In many cases, the TBT agreement has been cited in addition to some other agreements. Obviously, only after the final acceptance of the Panel and the Appellate bodies' reports is it possible to conclude whether or not the TBT Agreement was violated. For instance, in DS56, the United States requested consultation with Argentina citing, inter alia, Article 2 of the TBT agreement. The Panel found

violations of Article II and VIII of the GATT[44] but did not find violations of the TBT agreement. The Appellate Body upheld the Panel's findings. Thus, the citation of the TBT agreement in one's request for a panel does not mean that there was a violation of the TBT Agreement.

According to Table 4.4, it is observed that more than two thirds of all cases have been resolved so far. Almost two thirds of these cases have been found in the STC data on TBT. Article 2 of the TBT agreement has been the most frequently cited among all of the articles of the agreement. The second column to the left shows the average time between the date of the consultation request and the date of the report's acceptance. It took about 4.14 years on average for disputes to be resolved. The last column of this table shows the maximum duration between the consultation request and the case resolution. According to this data, it took a long time to solve the cases in which the EU and the USA were involved; with some cases taking more than 14 years.

4.4.2. Time consuming procedures within the DSM

A lengthy dispute procedure from the request for consultation until the DS resolution can be costly. Firstly, there are the costs for the complainant countries that are exporting to the countries imposing TBT measures (the costs of decreased exports). For instance, Canada requested consultation with the United States in December 2008 (DS384) concerning certain mandatory country of origin labelling (COOL) provisions. "Meat of swine, fresh or chilled—carcasses and half carcasses" with HS code "020311" was one the products covered by this dispute.[45] During the procedures, exportation of this product from Canada to the USA dropped from 13.68 million USD in 2007 to 5.12 million USD in 2008, and finally to 3,000 USD in 2012[46]. After the findings of the Dispute Settlement Body (DSB), the USA made a commitment to implement the rulings until May 2013. Thus, until the date of the dispute resolution, there were significant costs incurred by Canadian exporters of swine meat.

Secondly, long lasting consultations impose a high cost to the DSB analyzing the case. For example, in the extreme case of DS144, the dispute took more than 14 years to be completed; an apparently similar case to DS384, in which violations of Article 2.1 of the TBT agreement were concluded by the DSB. During this time, the US was discriminating against products imported from Canada in comparison to similar domestic products, incurring high costs on trade for Canada, as well as the costs of the expertize and analysis within the DSB.

The Uruguay Round Agreement provides the timetable for the dispute settlement mechanism. According to the schedule, from the time a case is requested for consultation, it should not take more than one year until the Panel's report becomes a ruling. If one side appeals, it should not take more than three months for the ruling of the Appellate Body (AB). However, the DSM

[44] According to the WTO website: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds56_e.htm, the Appellate Body upheld the Panel's report with some modifications including that: "The Panel found that the minimum specific duties imposed by Argentina on textiles and apparel are inconsistent with the requirements of Article II of GATT, and that the statistical tax of three per cent ad valorem imposed by Argentina on imports is inconsistent with the requirements of Article VIII of GATT."

[45] According to the matched item in the TBT STC data, item number 91.

[46] This data is collected from UN COMTRADE, available at: http://comtrade.un.org/.

Agreement has some flexibility and countries can resolve cases themselves through consultations at any stage.

Table 4.5 – TBT DS cases and their total duration until their final resolution

DS conclusion	No. DSs	DS Cases	Comments
In consultation without panel	8	137, 203, 233, 263, 279, 435, 441, 446	
In consultation but seems resolved	6	3, 41, 61, 100, 134, 144	DS3 and DS41 are resolved without panel establishment after more than 5 years (according to the STC database on SPS). DS61 seems to be resolved after about 5 years with DS58 (according to the WTO website[47]). DS100 seems to be resolved with related cases like DS384 and DS386 after more than 14 years since its request. DS134 seems to be resolved after more than 3 years with DS210. DS144 seems to be resolved after more than 14 years along with the related cases DS384 and DS386.
In consultation after panel establishment	5	369, 389, 400, 401, 434	
Withdrawn without panel before 1 year	3	5, 20, 85	
Withdrawn after 1 to 2 years by request	5	7, 12, 14, 151, 210	DS7, DS12, and DS14 have been resolved by mutual agreements before the Panel's reports. DS7's mutual agreement took less than one year after the request was made.
Cases that last from 2 to 3 years	10	72, 77, 232, 290, 2, 4, 56, 135, 231, 206	DS72, DS77, and DS232 were withdrawn before the Panel's reports. DS290 was concluded by the Panel's report. The rest of the cases have been concluded by the Appellate's report.
Cases that last from 3 to 5 years	4	291, 381, 384, 386	DS291 was resolved by the Panel's report after more than 3 years. The rest of the cases were resolved by the Appellate's findings after more than three years, but the adaptation would take place after more than 4 years.
Cases that last from 5 to 7 years	2	292, 293	These cases reached mutual agreements after more than 6 years, but the Panel's report was circulated about 3 years after the requests were made.
Cases that last from 13 to 15 years	2	26, 48	DS26 and DS48 reached mutual agreements after more than 13 and 14 years respectively, but the Appellate reports were circulated after 2 and one and a half years respectively after the requests were made.

Source: WTO website and own analysis.

Table 4.5 shows disputes with the total duration until the final resolutions of the cases. There are still 8 DS cases in consultation without the establishment of a panel body. The second row

[47] Available at: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds61_e.htm.

of this table shows the cases that, according to the WTO website, are still in consultation, but according to a deeper analysis, they seem to have been resolved. As it is explained in the comment column, all of these six cases took too long to be resolved[48]. Of course, long lasting consultations usually mean that both sides of the conflict are trying to reach an agreement and the nature of the WTO rules violation is not obvious[49]. The last five rows show that there are also many DS cases with procedures lasting for more than one year. In some of these cases, the duration for adopting DSB findings was very long. For instance, the last row shows two cases responded to by the EU in which the Appellate Body circulated its findings within less than 2 years of the request being made, and the implementation of the Appellate ruling took more than 12 years.

Thus, it appears that the DSM is working less expeditiously in comparison to the provisions in the Uruguay Round Agreement. There are only two DS cases (DS4 and DS2) leading to the Appellate Body's findings concluded within 15 months of the first request for consultation. The Appellate Body circulated its findings for 5 cases between 15 and 24 months after the date that the request had been made, among which, two of them, (DS26 and DS48), have been finally implemented about 14 years after the date of request. The rest of the Appellate Body's findings were circulated more than about 3 years after the first requests for consultation. It is worth mentioning that in addition to the significant costs incurred by the complainant countries due to TBTs, there are important costs incurred by the WTO Secretariat assisting DS bodies and carrying out detailed analyzes.

In 28 of the 45 requests for consultation, citing the TBT agreement, the complaining countries requested the establishment of a panel. For 25 of them, the panels were established and for 19 of them, the panels circulated their reports. After the Panel's reports, 8 cases were concluded by mutual agreement between the parties. 11 other cases led to the establishment of the Appellate Body because one of the parties appealed certain issues in the Panel's report. The Appellate Body has already provided its findings for all 11 cases listed in the reports[50]. Afterwards, the parties reached mutual agreements.

Table 4.6 shows the violations of WTO agreements confirmed by the final findings of the Panel and AB's reports. When the procedure is sent to the Appellate Body after the Panel report, the final conclusions of the AB should be adopted by the parties of the DSB, and not the Panel report. Cases in the left column have been found in the STC database on TBT. Only five out of the 19 cases analyzed by the Panel and/or the AB have been proven as violations of the TBT agreement. Thus, among 45 DS cases citing the TBT Agreement, only 11% (5 out of 45) of them have been TBT violations. All five cases were concluded by the Appellate Body. These simple statistics demonstrate how complicated the evaluations of TBT measures can be. DS231 covers only 3 observations, DS381 covers 13 observations, DS384 covers 28 observations, DS386 covers 34 observations, and DS406 covers only 1 observation from the TBT STC data. Even though the scope of trade flows covered by the disputes includes a limited number of

[48] It seems that these cases are resolved thanks to analysis of the linkages between the TBT and SPS datasets.
[49] It is worth mentioning that on the WTO website there is no updated information for these old cases.
[50] As mentioned earlier, DS100 did not lead to the establishment of a panel, but it seems that it is a similar case to DS384 that was concluded by the Appellate findings.

products, these DS cases were important for the exporters of goods on which the TBT measures were imposed.

4.4.3. Panel and Appellate Bodies' Reports

Table 4.6 – Violated Articles Approved by the Panel or the Appellate Body

DS	Respondent	Concluded Violated Art.	DS	Respondent	Concluded Violated Art.
406	USA	2.1, 2.9.2, 2.12 TBT	**72**	EU	Withdrawal of Request
386	USA	2.1 TBT	**56**	Argentina	II, and VIII of GATT
384	USA	2.1 TBT	**48**	EU	3.3, and 5.1 of SPS
381	USA	2.2 TBT	**26**	EU	3.3, and 5.1 of SPS
293	EU	Annex C(1)(a), 8, 5.1, 5.5, and 2.2 of SPS	**14**	EU	Withdrawal of Request
292	EU	Annex C(1)(a), 8, 5.1, 5.5, and 2.2 of SPS	**12**	EU	Withdrawal of Request
291	EU	Annex C(1)(a), 8, 5.1, 5.5, and 2.2 SPS	**7**	EU	Withdrawal of Request
290	EU	Annex C(1)(a), 8, 5.1, 5.5, and 2.2 SPS	**4**	US	III:4 of GATT
231	EU	2.4 TBT	**2**	US	III:4 of GATT
135	EU	III:4 GATT			

Note: The shaded areas are the cases concluded by the Panel and the white areas are the ones concluded by the Appellate Body.

Source: WTO website.

The principle of non-discrimination is one of the key provisions of the GATT/WTO system and is included in the National Clause (Article III of the GATT). Its equivalent in the TBT agreement is Article 2.1 that states: "members shall ensure that in respect of technical regulations, products imported from the territory of any Member shall be accorded treatment no less favorable than that accorded to like products of national origin and to like products originating in any other country." When it is proved that Article 2.1 has been violated, it should be clarified whether or not the policy measure was introduced to pursue protection of domestic industries rather than protection of human health, safety, animal or plant life, or the environment, i.e. in accordance with WTO regulations. However, clear conclusions on this issue have been presented in only four cases out of the 45 DS requests.

For example, in the case of DS406, the AB's report stated that the US violated articles 2.9.2 and 2.12 of the TBT agreement. It concludes that the imposition of the TBT measure by the US government violated transparency requirements. In order to maintain transparency, the DS body

recommended that the US implement the Appellate Body's report. In addition to the above-mentioned four cases in which Article 2.1 was violated, there have been 14 other requests for consultation under Article 2.1 of the TBT agreement. The Panel has analyzed four of them[51] and found no violation of the TBT agreement. Ten other cases have not been submitted to the Panel or the Appellate Body's analyzes in order to find whether they were violations of this article. Seven of these cases are still in consultation and three others were mutually agreed before the submission of the Panel report. In the case of DS231, the Appellate Body found that TBTs maintained by the EU were inconsistent with Article 2.4 and recommended that the measures be brought into conformity with the EC's obligations under this article. Thus, despite many arguments presented in the economic literature, there are only a few cases in which a violation of the non-discrimination principle was found by the DSM reports.

4.5. Econometric Analysis of the Linkages between Dispute Settlements and STCs

As discussed in the previous section, we have found few direct linkages between the raised TBT STCs and DS cases citing the TBT agreement. In this section, we will use econometrics to find evidence of such linkages. In other words, we will analyze the impact of TBT STCs on the occurrence of DS cases citing the TBT agreement. To achieve this goal, we will use an unbalanced panel database gathered from three data sources encompassing all WTO members from 1995-2011. We will consider the following equation to be estimated:

$$DS_{ijht} = \alpha + \beta_1 STC_{ijht} + \beta_2 SM_{ijht} + \beta_3 T_{ijht} + \beta_4 Y_{it} + \beta_5 Y_{jt} + \theta_i + \vartheta_j + \delta_h + \mu_t + \varepsilon_{ijht} \qquad (4.1)$$

where the dependent variable DS_{ijht} is the number of DS cases responded to by the reporter country *i* that is complained about by country (or third parties) *j* on product *h* at a 2-digit level of HS at time *t*. This variable is gathered from the WTO website covering all DS cases citing the TBT agreement during 1995-2011. This variable is a count variable that takes discrete values. Most of the DS cases are addressing a group of products that are correspondingly matched with HS rev. 2. The maximum value of this variable in the sample is 2, referring to DS3, which was responded to by the Republic of Korea, and to DS cases 290 and 291, which were responded to by the EU[52].

STC_{ijht} is the TBT STC on product *h* maintained by the reporter country *i* raised by partner country *j* at time *t*, which is obtained from the database provided by the WTO secretariat.

SM refers to the share of product imports from the partner country relative to the total imports of that product. In the majority of the requests for consultation within the DSM, the complainant

[51] DS290, DS291, DS292, DS293.

[52] There are some DS cases such as DS291, DS292, and DS293, for which only the complainant countries are different, while they are also third parties in the two other cases. Hence, such DS cases are considered in our analysis as one unique DS case. Therefore, the maximum value of the DS variable is 2, meaning that for DS290 and DS291 (DS292 and DS293) two cases exist responded to by the EU for a specific product in 2003.

and third party countries are motivated to make their requests due to the significant share of their exports within the total import of the respondent country. Therefore, we expect to find a positive relationship between this variable and the occurrence of a DS case. The data on bilateral imports of products is obtained from the WITS website[53].

T stands for the average tariff imposed by the reporter country on all subcategories of a 2-digit level of Harmonized System products imported from the partner country. Most favored nation (MFN) applied tariff rates are considered in the analysis obtained from WITS[54].

Regulations imposed within TBT notifications are usually permanent rules affecting trade during the long run. A similar hypothesis can be argued for tariff rates. Besides, the share of imports, or being a major exporter to a country in a previous year, can be a motivation for a request for consultation. Therefore, in our analysis, we also consider the lag of these three variables in separate specifications.

The trade policy of a large country can have more significant implications than that of a small country. Obstacles imposed by TBT regulations at the focus of a DS case can draw more attention if the maintaining importer country is a large country. On the other hand, controlling for trade shares (*SM* variable), a small country that has fewer trade partners and faces a restrictive TBT regulation, can be more affected than a large country. Therefore, a small country is potentially more vulnerable to an unnecessary obstacle and more motivated to initiate a dispute. In order to control for the size of both trade partners, we include the real Gross Domestic Product (GDP) of the two countries. The data for GDP is collected from the World Development Indicator database provided by the World Bank[55].

In the above estimation equation, $\theta_i, \vartheta_j, \delta_h,$ and μ_t are, respectively, the possible reporter, partner, product, and time fixed effects, and ε_{ijht} is the error term. The database used is from unbalanced panel data. Since the dependent variable is count discrete data, we apply Maximum Likelihood Poisson regression to achieve unbiased results. Moreover, due to the heterogeneity of the countries and products, there are possible fixed effect problems and heteroskedasticity within the error term. To control for these issues, we use a Fixed Effect (FE) robust Poisson estimator to attain the most consistent unbiased regressions. Besides, the efficiency and consistency of the FE estimator is tested using the Hausman test. It is important to mention that FE Poisson regression will drop some observations from the dataset if no variation within the dependent variable is detected during the period. Firstly, single observations within each group of individual (i.e. product-paired-country) are dropped. Secondly, if there are no changes of the dependent variable within a specific group during the period, the group will be completely dropped. This omission of a variable is consistent with the econometric specification of the Poisson FE method, giving robust results. However, the estimation of the pooled Poisson regression will be presented in the appendix as a robustness check. In the following sub-section, the results of the regressions will be discussed.

[53] Can be found at: https://wits.worldbank.org/.
[54] Preferential tariff rates and Effectively Applied rates have also been tested giving similar results.
[55] Can be found at: http://data.worldbank.org/data-catalog/world-development-indicators.

4.5.1. Estimation Results

Table 4.7 represents the FE Poisson regression results of the model. Incidence Rate Ratio (IRR) is presented as the estimated coefficients of the variables. Thus, a coefficient bigger than one indicates the positive impact of the given variable on the dependent variable, and a coefficient smaller than one indicates a negative impact. As it is observed within all of the specifications, there is a statistically significant positive relationship between disputes and current TBT STCs. From the second column to the left, we can state that, given that other variables are constant in the model, a new TBT STC raised by a partner country on a TBT imposed by a reporter country on a specific product is expected to increase the probability of a DS case being requested by the partner on the given product by about 1.142 times. However, TBT STCs raised in the previous year (TBT STC_{t-1}) are statistically significant but decrease the probability of an occurrence of such a DS case, holding the current TBT STCs and other variables constant. Although current TBT STCs have strong positive influence on DS requests to the WTO, previous TBT STCs act in the opposite direction.

The possible explanation of these results can be as follows. Usually, TBT regulations are of a long lasting nature. The significant effects of regulations are generally observed instantly after their imposition. After a period of time, producers can adjust the characteristics of their products to meet new regulations and can continue their participation in the foreign market. This means that a TBT STC that is raised in a previous year does not cause the same problems that it had provoked in the beginning. As Swann (2010) demonstrated in his literature review, the implementation of standards, increasing market transparency, can have a positive impact on trade flows in the long run. Therefore, it is very likely that TBT STC, existing after some period of time, would decrease the "demand" for consultation, as the producers and countries facing those TBTs have already complied with those standards. Overall, we can state that our analysis confirms the hypothesis that the imposition of new TBT STCs can act as an early warning for future DS cases.

Share of imports is statistically significant at a 10% level but only in one specification including only TBT STC. This suggests that a major exporter is not evidently more eager to request consultation within the DSM than a smaller exporter is. Hence, increasing the share of imports from a trade partner will not increase – in a statistically significant way - the probability of a trade partner filing a case.

As discussed earlier, there is a possible substitutability between tariffs and NTMs. In our specifications ((3) to (5)), we control for both of them. The results show a statistically significant positive relationship between current tariffs and the occurrence of a TBT DS case. Since the tariffs contained in the schedules of concessions are bound for WTO members, one can argue that a one-unit drop in the tariff on a product, would decrease the probability of an occurrence of a DS case citing the TBT agreement on the given product by a factor of about 0.96[56], holding other variables constant. Probably, this means that decreasing tariffs are treated as a signal of trade liberalization, while countries only request for consultation when they

[56] $\frac{1}{1.04}$

believe that the TBT agreement has been violated by the imposition of unnecessary obstacles to trade. Thus, such a positive relationship between tariffs and the requests for consultation is quite in line with the economic literature.

Table 4.7 – FE Poisson Regression Results (IRR)

	M1	M2	M3	M4	M5
TBT STC $_t$	1.182**	1.183**	1.182**	1.152*	1.142*
	(0.088)	(0.089)	(0.089)	(0.087)	(0.085)
TBT STC $_{t-1}$	0.491***	0.490***	0.492***	0.485***	0.485***
	(0.045)	(0.045)	(0.045)	(0.044)	(0.044)
SM $_t$		14.21*	11.18	11.08	14.76
		(22.3)	(18.6)	(18.1)	(24.5)
SM $_{t-1}$		0.679	0.598	0.633	0.779
		(0.96)	(0.87)	(0.92)	(1.14)
T $_t$			1.025	1.039**	1.039**
			(0.017)	(0.019)	(0.019)
T $_{t-1}$			0.985***	0.990	0.990
			(0.0058)	(0.0071)	(0.0072)
Y $_{it}$				39.69***	34.83***
				(19.4)	(17.3)
Y $_{jt}$					0.468**
					(0.17)
N	31413	31413	31413	31413	31413
AIC	6673.4	6684.7	6666.1	6629.3	6631.5
BIC	6690.1	6768.3	6716.2	6721.2	6756.8
Time Effects	Yes	Yes	Yes	Yes	Yes

Exponentiated coefficients reported indicate Incidence-Rate Ratios (IRR)
Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

As discussed earlier, the real GDP of the reporter and the partner country has the expected influence on the occurrence of DS cases. The bigger the reporter country is, the higher the effects will be of its policy instruments on international trade. The statistically significant coefficient of the real GDP of the reporter suggests that a 1% increase in the real GDP of that country is expected to increase the probability of that country being a respondent for a DS case by about 34 times. On the other hand, the statistically significant coefficient of the partner's real GDP suggests that the smaller the trade partner is, the higher the probability of that country being a complainant by about 2.13 times. A smaller country is more vulnerable than a larger country to the prohibitive trade policies of a given country.

4.6. Concluding remarks

In this chapter, we present a summary of the STC database on TBT. The newly created STC database is a useful tool in increasing information on TBT measures and reducing the asymmetry of information. It has been mentioned that the STC data on TBT has several potential weaknesses resulting from the duplication of observations. In order to improve the data for analytical analysis, we suggest the deletion of multiple observations within one STC item.

The descriptive analysis of linkages between DS cases and the STC database on TBT measures was based on matching information from both sources. Out of 45 requests for consultation in the DSM for violation of the TBT agreement, 27 cases were found in the STC data as well; among which four cases were found in the SPS STC database. There are 19 cases in the TBT STC database that are related to 23 disputes. The probable reasons for the dissimilarity between the trends of the STCs and the initiated disputes on TBT have been discussed in the paper. Gaps between the dates of the raised concerns on TBT and the requested cases in the DSM, multiple cases of DS relating to one STC, and multiple items of STC relating to one DS case, are probably the main reasons for such dissimilarities.

According to the citations in the DS cases, in the Panel's and the Appellate Body's reports, article 2 of the TBT agreement was the most frequently violated article in all cases. In 16 cases, Article 2.1 of the TBT agreement was cited and it was the main issue of some the Appellate Body's reports. In fact, discriminative aspects of the TBTs imposed by some governments have led to complaints by other members, leading to requests for consultation. Even though all WTO members demand transparency in trade policies, some TBTs are still having discriminatory effects in international trade. The European Communities and the United States of America are maintaining most of the STCs on TBT and they are the respondent for most of the DS cases. In 45 cases of disputes citing the TBT agreement, the DS body has proved in its findings that EU members have violated the TBT agreement once and violated other WTO agreements 8 times. We also showed that the USA has violated the TBT agreement four times and other WTO agreements twice. While China is the second placed country for maintaining TBT STCs, there have been no consultations requested against this country under the DSM regime. Nevertheless, the EU as the first and the US as the third placed country imposing TBT STCs have responded to the largest numbers of DS cases citing the TBT agreement. It is worth mentioning that countries raising STCs are mostly quite reluctant to initiate cases in the DSM in order to maintain frictionless multilateral trade with their partners. In other words, WTO members usually prefer using bilateral and multilateral negotiations under the TBT Committee rather than rapidly starting costly disputes.

Thus, based on a simple descriptive analysis, we find no genuine evidence that STCs provide a good foresight for future disputes on TBTs. However, the econometric analysis allows us to draw more precise conclusions. We provided econometric evidence linking the current raising of STCs on TBT and the request for consultation citing the TBT agreement. In other words, at present, an increase in TBT STCs increases the probability of raising a request for consultation citing the TBT agreement within the DSM. Nevertheless, past STC TBT does decrease this

probability, since producers have already had time to adapt their products to new TBT regulations.

Thus, we believe that trade economists should analyze both sources, i.e., STCs and disputes, in order to find out whether TBT measures are creating "unnecessary" barriers to trade. Moreover, an increase in the number of TBT STCs should be interpreted as a warning signal for new, costly, and long-lasting disputes within the WTO system. These TBT measures can create significant trade distortions if they discriminate between domestic and foreign suppliers, and thus, violate the principle of non-discrimination.

4.7. Appendix

Table 4.8 – Countries (groups of countries) respondents of STCs raised by other members

No	Member Maintaining	No. Obs.	No. STCs	No	Member Maintaining	No. Obs.	No. STCs
1	European Union	3138	64	**23**	Chile	174	2
2	China	1366	39	**24**	Viet Nam	68	2
3	United States	1083	35	**25**	Hong Kong, China	13	2
4	Korea, Republic of	698	25	**26**	Moldova	8	2
5	India	642	18	**27**	Norway	2	2
6	Brazil	635	18	**28**	Saudi Arabia, Bahrain, Kuwait	465	1
7	Japan	198	11	**29**	Kuwait	247	1
8	Indonesia	613	10	**30**	Tunisia	161	1
9	Mexico	509	9	**31**	Ukraine	161	1
10	Canada	177	9	**32**	Venezuela	44	1
11	Colombia	78	8	**33**	Qatar	20	1
12	Argentina	177	7	**34**	Kenya	17	1
13	Thailand	29	6	**35**	Croatia	11	1
14	Taipei, Chinese	399	5	**36**	Philippines	10	1
15	South Africa	341	4	**37**	Switzerland	6	1
16	Egypt	249	4	**38**	Australia	2	1
17	Turkey	23	4	**39**	Uruguay	2	1
18	Israel	12	4	**40**	Bahrain	1	1
19	Malaysia	65	3	**41**	Jordan	1	1
20	Peru	62	3	**42**	Saudi Arabia	1	1
21	Ecuador	11	3	**43**	United Arab Emirates	1	1
22	New Zealand	506	2				

Source: Own calculations from STC database

Table 4.9 – Products at 2-digit HS 2 level in the focus of STCs

Rank	Codes	N. STC	N. Obs.	Rank	Codes	N. STC	N. Obs.	Rank	Codes	N. STC	N. Obs.
1	22	57	543	**28**	29	12	511	**55**	50	6	42
2	85	41	428	**29**	61	12	329	**56**	24	6	15
3	2	40	480	**30**	95	12	68	**57**	34	5	72
4	84	40	291	**31**	62	11	337	**58**	39	5	11
5	4	38	388	**32**	63	11	164	**59**	25	5	10
6	3	36	290	**33**	72	11	97	**60**	37	4	71
7	21	34	224	**34**	30	11	93	**61**	70	4	30
8	19	34	191	**35**	64	10	111	**62**	68	4	20
9	16	34	188	**36**	69	10	47	**63**	96	4	5
10	15	33	770	**37**	55	8	189	**64**	41	3	40
11	8	32	523	**38**	58	8	91	**65**	71	3	23
12	12	32	511	**39**	60	8	83	**66**	74	3	13
13	7	31	519	**40**	65	8	45	**67**	48	3	11
14	9	31	363	**41**	43	8	35	**68**	86	3	10
15	20	31	326	**42**	32	7	167	**69**	6	3	8
16	11	30	326	**43**	51	7	88	**70**	83	3	4
17	10	30	291	**44**	54	7	78	**71**	91	2	22
18	18	30	217	**45**	56	7	74	**72**	44	2	18
19	33	29	279	**46**	52	7	73	**73**	75	2	16
20	17	29	144	**47**	53	7	73	**74**	5	2	12
21	87	26	223	**48**	31	7	67	**75**	82	2	11
22	90	26	119	**49**	36	7	65	**76**	27	2	5
23	94	18	32	**50**	42	7	42	**77**	76	2	2
24	1	14	114	**51**	73	7	36	**78**	92	1	3
25	40	14	100	**52**	57	7	35	**79**	26	1	2
26	38	13	295	**53**	35	6	73	**80**	88	1	2
27	28	12	578	**54**	59	6	66	**81**	23	1	1
								82	Undefined	42	57

Source: Own calculations from STC database
The last one (rank 82) is for all those STCs that do not have defined product in the database.

5. Services trade liberalization in the transport sector

Abstract: Transportation sectors play an important role in the economies of the advanced European economies. The aim of this chapter is to assess the degree of the trade liberalization and its impact on bilateral trade of rail transportation services. We estimate a gravity equation using bilateral trade data similar to those used in the analysis of merchandise trade. In order to do that, we provide an up-to date inventory of the currently available bilateral services trade data in rail transportation sub-sector. In our estimations, we include several auxiliary variables related to transport infrastructure as well as the volume of bilateral trade in goods. The estimated gravity model is then used to compute time varying tariff equivalents. In the absence of data regarding possible duties or tariffs imposed on services trade, computation of tariff equivalents such as proposed in the study can shed light on the level of liberalization.

5.1. Introduction

Modern economies are increasingly dominated by services, which cover a broad range of industries, encompassing 'network industries' such as electricity, natural gas and telecommunications, other 'intermediate services' such as transport, financial intermediation, distribution, construction and business services, and 'final demand services' such as education, health, recreation, environmental services, tourism and travel. Services for a long time were believed to be non-tradable, but technological changes have allowed an increasing number of services markets to be contested internationally through cross-border trade (mode 1) and commercial presence (mode 3).[57] Economic theory emphasizes that countries can derive welfare gains from freer trade, and that the proposition applies to both goods and services. However, the types and forms of liberalization of services are quite different from those of liberalization of merchandise trade. Barriers to the flow of goods typically arise as customs and non-tariff barriers (NTBs), and hence for goods trade most discussion of liberalization focuses on tariffs and on NTBs. On the other hand, barriers to trade in services are typically regulatory in nature, and outcomes of services liberalization depend heavily on the regulatory environments.

Recent research indicates that barriers to services trade in the world remain prevalent, and that service barriers in both high income and developing countries are higher than those for trade in goods. Policies are more liberal in OECD countries, Latin America and Eastern Europe, whereas most restrictive policies are observed in Middle East and North Africa (MENA) and Asian countries. Overall pattern of policies across sectors is increasingly similar in developing

[57] The General Agreement on Trade in Services (GATS) distinguishes between four modes of supplying services trade: cross border supply (mode 1), consumption abroad (mode 2), commercial presence (mode 3), and presence of natural persons (mode 4). While mode 1 refers to services supplied from the territory of one member into the territory of another, mode 2 consists of services supplied in the territory of one member to the consumers of another. On the other hand mode 3 refers to services supplied through any type of business or professional establishment of one member in the territory of another (foreign direct investment (FDI)), and mode 4 includes both independent service suppliers, and employees of the services supplier of another member (consultants).

and industrial countries. Whereas telecommunications and banking services are more competitive, transport and professional services remain bastions of protectionism.[58]

Barriers to services trade lead to inefficiencies in service sectors and to high costs of services. Since the productivity and competitiveness of goods and services firms depend largely on access to low cost and high-quality producer services such as transportation, distribution, telecommunications, and finance, and since they have powerful influence on economic growth, it is of utmost importance to increase the efficiency of service industries, which can largely be achieved through liberalization of service industries.

In principle, countries can choose to liberalize a service sector unilaterally and try to derive efficiency gains. Indeed, during the last two decades there has been significant unilateral liberalization in services by different countries driven by the prospects of large welfare gains. Many countries have taken action to increase competition on service markets by liberalizing FDI and privatizing state-owned or controlled service providers. However, unilateral liberalization may be constrained by the fact that a country cannot on its own gain-improved access to larger foreign markets. Second, a country may face difficulty in increasing competition. Finally, a country may lack the expertise and resources to devise and implement the appropriate domestic regulatory policies.

In recent years, the number of regional trade agreements has increased significantly. Many provide free trade in goods but also include some measures to facilitate trade in services. Such agreements could lead to gains from liberalization of trade in services. Nevertheless, not much has been achieved in terms of actual liberalization with the exception of the European Union (EU) and a small number of agreements between high-income countries. On the other hand, multilateral negotiations on services began during the Uruguay Round, which culminated in the signing of the General Agreement on Trade in Services (GATS) in 1995. Article XIX GATS required members to launch new negotiations on services no later than 2000, and periodically thereafter. Initial negotiations were launched in 2000, which later became part of Doha. Between 2000 and the end of 2005, WTO members pursued a bilateral approach to negotiations, submitting request to others and responding to requests with offers. However, large asymmetries in interest across membership impeded progress. In 2006, WTO members launched an effort to complement the bilateral request offer process with a plurilateral or 'collective' approach. This involved subsets of the WTO membership seeking to agree to a common 'minimum' set of policy commitments for a given sector. However, even with the new approach not much progress could be achieved until now.

In order to design successful reform strategies it is crucial that the effects of economic liberalization be analyzed thoroughly. To do that, we first need to quantify the barriers to trade in services. The simplest and most-common approach to measuring the barriers to trade in services involves frequency measures developed by Hoekman (1995). A more elaborate restrictiveness measure than that of Hoekman has been constructed for different service industries by the Australian Productivity Commission (APC) in collaboration with the

[58] See B. Gootiiz and A. Mattoo (2009).

University of Adelaide and the Australian National University. To develop these indices, the actual restrictions on trade in a service industry have been compiled from specifically designed questionnaires using a number of different sources. These restrictions were then assigned scores and grouped into categories, each of which is assigned a numeric weight. These scores and weights were based on subjective assessments of the costs of restrictions to economic efficiency. Finally, the sectoral tariff equivalents were computed using these scores and econometrically estimated relations between restrictiveness values and performance indicators such as the price of the service under consideration.[59] Finally, we have the gravity approach developed by Francois and Hoekman (1999).

In the following, we shall focus our attention on one specific transportation sector, namely the rail transportation sector. There are several reasons why the analysis of this specific sector is important to understand the implications of liberalization efforts. This sector has been and it still is nationalized in majority of European countries based on natural monopoly argument; and it is the sector in which network effects exist. The entry to this sector by independent operators has been severely limited by the infrastructure ownership. In the majority of European countries, the rail infrastructure has been owned by state rail undertakings (RUs). Although the EU has issued three packages of directives aiming at liberalization of the sector, there were large differences in the implementation of legislation among the EU Member States as revealed by a study conducted by IBM Consulting Services. The performance of the sector depends largely on the quality of rail infrastructure, and the sector faces strong competition from road transportation. However, the investments in rail transportation sector in Poland and in the majority of new member states of the EU have been far too small in relation to modernization and maintenance needs.

The chapter is structured as follows. Section 1 focuses on the impact of liberalization of rail services. For this purpose, we use the gravity approach and the liberalization indices constructed by the IBM Consulting Services. Thereafter, in Section 2 we consider the gravity approach to calculate tariff equivalents in the rail sector. Finally, Section 3 concludes.

5.2. The Impact of Institutional Liberalization on Rail Services' Trade

In this section, we analyze the impact of liberalization on the import of rail transport services. We check whether the liberalization introduced by the European countries has increased the trade of these services. This hypothesis will be tested in a standard gravity model using econometric techniques. The gravity model has been applied by Park (2002) to trade in services. Afterwards, several other authors have used this framework in a similar fashion. These include Grünfeld and Moxnes (2003), Lejour and de Paiva Verheijden (2003), Walsh (2006) or Marouani and Munro (2011).

We applied the gravity model to all four categories of rail transport services, available in the Extended Balance of Payments Services (EBOPS). Thus, our econometric analysis will be

[59] See e.g. Findlay and Warren (2000).

presented in four separate specifications for each category of rail transport services. In each specification, apart from standard gravity variables, four different liberalization indices will be included in a separate equation as follows:

$$\ln(Im_{irpt}) = c + \gamma_r + \eta_p + \lambda_t + \beta_1 \ln L_{rt} + \beta_2 \ln L_{pt} + \beta_3 \ln GDP_{rt} + \beta_4 \ln GDP_{pt} + \beta_5 \ln(diff\_GDP) + \beta_5 \ln(dist_{rp}) + Z_{rpt} + \varepsilon_{irpt} \quad (5.1)$$

where Im_{irpt} is the import of rail transport service *i* from the partner country *p* to the reporter country *r* at time *t*. The term c is the intercept. *L* is one of the liberalization indices. *GDP* is the nominal GDP in USD. The variable *diff_GDP* refers to the differences of the real GDP per capita in USD between the two countries. $dist_{rp}$ is the distance between the two partners in kilometres. In general, according to the gravity approach, the volume of trade is an increasing function of the economic potential trading partners (GDP) and a decreasing function of the distance between them. *Z* is a vector of some control variables as follows, used in the majority of studies based on gravity model.

Contig, *comlang_off*, and *colony* are respectively referring to the contiguity, common official language, and common colonial history between the two trading partners. These variables are expected to increase bilateral trade between the two countries as they are reducing the costs associated with trade. *ln_Inv* and *ln_Main* that are respectively natural logarithms of rail infrastructure investment and maintenance in each partner country. Those variables, improving the quality of rail infrastructure, are expected to have positive effects on the trade of rail transport services. ln_Ex_{rpt} and ln_Im_{rpt} are respectively total bilateral export and import of goods between the two partners in natural logarithm forms. Since freight transport is one of the possible means of goods transportation between European countries, it is expected that these variables should have positive impact on the import of rail transport services, especially on freight transport services.

γ_r, η_p, and λ_t are respectively, reporter country, partner country and time fixed effects. ε_{irpt} is the error term. Running normal OLS estimation for the above model produces biased results due to country specific and time fixed effects. Therefore, we used Fixed Effect (FE) and Random Effect (RE) estimators, where Hausman test suggests the efficiency and consistency of them to be chosen. We recall that geographical variables, that are time invariant are dropped out of FE regressions, while they are included in the RE estimations.

Table 5.1 – Data Description

Variable	Description	Source
ln_Im_{irp}	Import of Transport Services – USD Millions	TSDv8.7 database provided by Francois and Pindyuk (2013)
Services flows (*i*):	EBOPS Code 219: Rail transport	
	EBOPS Code 220: Passenger	
	EBOPS Code 221: Freight	
	EBOPS Code 222: Other	
ln_Inv	Infrastructure Investment – EUR Millions	International Transport Forum at the OECD http://www.internationaltransportforum.org/statistics/investment/data.html)
ln_Main	Infrastructure Maintenance – EUR Millions	International Transport Forum at the OECD: http://www.internationaltransportforum.org/statistics/investment/data.html)
rail_dens	Rail lines (total route-km) divided by the Area of the country (sq. km)	Own Calculations – Data fromWorld Development Indicator
ln_diff_GDP	Difference of GDP per capita (constant 2000 USD) between the two countries	World Development Indicator
ln_GDP	GDP (current USD)	World Development Indicator
ln_Ex_{rp}	Total Export from Reporter to Partner – Thousands USD	World Integrated Trade Solution (WITS) - UN COMTRADE
ln_Im_{rp}	Total Import to Reporter from Partner – Thousands USD	World Integrated Trade Solution (WITS) - UN COMTRADE
ln_dist	Distance between the two countries in km	CEPII database
Contig	Contiguity of the two countries	CEPII database
comlang_off	Common official language in the two countries	CEPII database
colony	Colonial history of the two countries	CEPII database
ln_Access	Access Liberalization Index (data exists for 2002, 2004, 2007, and 2011. Interpolation for missing year during 2002-2010 is estimated)	IBM, Global Business Services, Rail Liberalization Index 2011
ln_COM	COM Liberalization Index (data exists for 2002, 2004, 2007, and 2011. Interpolation for missing year during 2002-2010 is estimated)	IBM, Global Business Services, Rail Liberalization Index 2011
ln_LEX	LEX Liberalization Index (data exists for 2002, 2004, 2007, and 2011. Interpolation for missing year during 2002-2010 is estimated)	IBM, Global Business Services, Rail Liberalization Index 2011
ln_OveralLib	Overal Liberalization Index (data exists for 2002, 2004, 2007, and 2011. Interpolation for missing year during 2002-2010 is estimated)	IBM, Global Business Services, Rail Liberalization Index 2011

The analysis is based on an unbalanced panel database during 2002-2010 for 27 European countries (Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, and United Kingdom). Dependent variable, Im_{irpt}, is obtained from TSDv8.7 database provided by Francois and Pindyuk (2013). Liberalization indices are collected from IBM, Global Business Services and we used interpolation for the missing years during 2002-2010. The detailed description of those indices has been presented in the previous section.

The first three control variables and *Dist* are geographical gravity variables gathered from CEPII[60]. Ex_{rpt} and Im_{rpt} variables are provided by UN COMTRADE data collected from World Integrated Trade Solution (WITS)[61]. Infrastructural variables are collected from International Transport Forum at the OECD[62]. The rest of the variables are collected from the World Development Indicators (WDI) provided by the World Bank[63]. The following table represents the complete list of variables and data sources.

5.2.1. Whole Rail Transport Services (BOP Code 219)

Table 5.2 shows the estimation results for the Whole Rail Transport category (BOP: 219). The difference between the four equations is mainly inclusion of a different liberalization index in each of them. According to the Hausman test, all equations are preferred to be estimated using FE regression. Among all liberalization indices, only Access index for the partner country and LEX index for the reporter country has statistical positive significant coefficients (at 5% and 10% levels of significance respectively). Thus, the improved access to the rail infrastructure of the exporters and legal liberalization of importer stimulates overall trade in rail services.

Infrastructure investment in the railroads of the reporter country has no statistical significant effect on the import of rail services. Maintenance of railroads in the reporter countries statistically significantly decreases the import of rail transports. However, infrastructure investment and maintenance of the partner country increases the import of these services from the partner countries, according to almost all statistical significant positive coefficients.

Railroad density in the reporter country has statistical negative significant coefficients in all equations, which suggests that the development of rail infrastructure is negatively related to imports of rail transport services. This result may stem from the fact that in some countries (such as Poland) due to a period of disinvestments in railway transport infrastructure, the quality of majority of railroads is low and cannot be used for international freight or passenger transportation, while due to other factors imports of rail trade services went up. However, railroad density in the partner country has no statistical significant impact on the export of rail transports.

Differences in real GDP of both partners and nominal GDP of both countries have no impact on imports of all rail transport services according to almost no statistical significant coefficients. Export of goods from reporter to the partner country is significantly increasing the import of rail transport services. This suggests a country increasing the exportation of goods to a partner for about 1 percent, increases the demand for rail transport services by about 0.3 percent from the partner. Surprisingly, the estimated parameter on the imports of goods is not only statistically insignificant, but also it is roughly half of the size of the export coefficient. This

[60] Centre d'Études Prospectives et d'Informations Internationales and Can be found at: http://www.cepii.com/anglaisgraph/bdd/distances.htm
[61] Can be found at: https://wits.worldbank.org/
[62] Can be found at: http://www.internationaltransportforum.org/statistics/investment/data.html
[63] Can be found at: http://data.worldbank.org/data-catalog/world-development-indicators

suggests that merchandise exports create extra demand for foreign rail services, while they do not boost the exporting country rail sector exports.

Table 5.2 – Regressions of Whole Rail Transport (219)

	(1)	(2)	(3)	(4)
Type of Estimation	**FE**	**FE**	**FE**	**FE**
Dependent:	Im_{irp}	Im_{irp}	Im_{irp}	Im_{irp}
ln_Inv$_r$	-0.10	-0.11	-0.13	-0.088
	(0.11)	(0.11)	(0.11)	(0.11)
ln_Main$_r$	-0.19**	-0.17**	-0.19**	-0.19**
	(0.085)	(0.084)	(0.085)	(0.085)
ln_Inv$_p$	0.24**	0.21*	0.31***	0.24**
	(0.11)	(0.11)	(0.11)	(0.11)
ln_Main$_p$	0.13	0.16**	0.14*	0.14*
	(0.082)	(0.082)	(0.083)	(0.082)
rail_dens$_r$	-48.1**	-47.5**	-52.4***	-49.0**
	(19.4)	(19.5)	(19.7)	(19.4)
rail_dens$_p$	19.4	18.6	17.4	16.2
	(19.3)	(19.3)	(19.5)	(19.3)
ln_diff_GDP	-0.15	-0.13	-0.11	-0.15
	(0.11)	(0.11)	(0.13)	(0.11)
ln_GDP$_r$	-0.65	-0.26	-1.12**	-0.80
	(0.49)	(0.47)	(0.52)	(0.51)
ln_GDP$_p$	-0.15	0.25	0.26	-0.13
	(0.50)	(0.49)	(0.52)	(0.51)
ln_Ex$_{rp}$	0.30*	0.29*	0.27*	0.30*
	(0.16)	(0.16)	(0.16)	(0.16)
ln_Im$_{rp}$	0.15	0.13	0.12	0.14
	(0.17)	(0.18)	(0.19)	(0.17)
ln_Access$_r$	0.16			
	(0.21)			
ln_Access$_p$	0.37*			
	(0.21)			
ln_COM$_r$		-0.22		
		(0.21)		
ln_COM$_p$		-0.053		
		(0.22)		
ln_LEX$_r$			0.68**	
			(0.31)	
ln_LEX$_p$			0.091	
			(0.32)	
ln_OverallLib$_r$				0.33
				(0.26)
ln_OverallLib$_p$				0.38
				(0.27)
Constant	14.4	-0.98	14.8	16.6*
	(9.60)	(9.18)	(10.1)	(9.95)
Observations	1022	1022	983	1022
R^2	0.046	0.043	0.056	0.047
AIC	2259.1	2263.2	2163.5	2258.6
BIC	2328.1	2332.3	2231.9	2327.6
Hausman Test	0.000	0.000	0.000	0.000

Standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01

5.2.2. Rail Passenger Transport Services (BOP Code 220)

Table 5.3 shows the estimation results for the Rail Passenger Transport category (BOP: 220). According to the Hausman test, only specification (7) is preferred to be estimated using FE regression and others are better to be estimated using RE. Among all liberalization indices, only LEX index for the reporter country has statistical positive significant coefficient.

Infrastructure investment and maintenance for both countries has statistically insignificant coefficients in all four specifications, which suggests no relationship between these variables and import of rail passenger transport services.

Railroad density in the reporter country has statistical negative significant coefficients in three of the equations. Moreover, railroad density in the partner country has no statistical significant coefficients in any of the equations. Again, this estimation implies the same possible problem as stated above for the whole rail transport services.

Differences in real GDP of both partners and nominal GDP of reporter country have no specific relationship with the import of rail passenger transport services. Nevertheless, nominal GDP of the partner country has statistical significant positive coefficients in all columns of this table. Since nominal GDP is a proxy for potential market of the partner economy, we argue that the bigger the partner market is, the bigger will be the export of rail passenger transport services from that country. In fact, in three RE estimations the coefficients are about 0.61 that correspond to elasticity. Thus, we can observe that a 1% increase in the nominal GDP of the partner country will increase the export of rail passenger services to the reporter country by about 0.61 percent.

Export and import of goods between the two partners have no relationship with the import of rail passenger transport. This result is not surprising because one can argue that export and import of goods are related to freight rather than passenger transports.

Contiguity and common official languages between the two partners can increase the trade of rail passenger transports in the FE specifications. The positive impact of common border is very strong. It is not surprising, given the fact that rail operational systems are not fully compatible among European countries.

Statistical significant negative coefficients for distance variable in all RE regressions suggest that import of rail services are also decreasing functions of the distance between the two partners. This result is in line with the standard gravity model. In fact, one can argue that passenger travel for longer distances are preferred by air transports rather than rail transports, and that is the reason for the negative relationship observed here. Colonial history of the two countries has received no statistical significant coefficients. It is important to note that these findings are along with the general gravity expectations for goods rather than services.

Table 5.3 – Regression of Rail Passenger Transport

	(5)	(6)	(7)	(8)
Type of Estimation	**RE**	**RE**	**FE**	**RE**
Dependent:	Im_{irp}	Im_{irp}	Im_{irp}	Im_{irp}
ln_Inv$_r$	0.14	0.18	0.18	0.14
	(0.14)	(0.14)	(0.18)	(0.14)
ln_Main$_r$	0.12	0.13	0.12	0.12
	(0.081)	(0.083)	(0.13)	(0.082)
ln_Inv$_p$	0.10	0.034	0.091	0.10
	(0.15)	(0.16)	(0.21)	(0.15)
ln_Main_p	-0.099	-0.070	-0.084	-0.10
	(0.091)	(0.092)	(0.16)	(0.092)
rail_dens$_r$	-8.66*	-9.09*	-40.0	-8.59*
	(5.14)	(5.16)	(32.6)	(5.13)
rail_dens$_p$	4.18	4.61	7.46	4.24
	(5.28)	(5.32)	(34.5)	(5.28)
ln_diff_GDP	-0.11	-0.12	0.034	-0.11
	(0.10)	(0.10)	(0.26)	(0.10)
ln_GDP$_r$	0.19	0.13	-1.11	0.20
	(0.28)	(0.28)	(1.15)	(0.28)
ln_GDP_p	0.61**	0.62**	2.18*	0.61**
	(0.27)	(0.27)	(1.13)	(0.27)
ln_Ex$_{rp}$	0.28	0.24	-0.56	0.28
	(0.22)	(0.22)	(0.51)	(0.22)
ln_Im$_{rp}$	0.017	0.044	-0.39	0.017
	(0.22)	(0.22)	(0.41)	(0.22)
contig	0.98**	0.98**		0.99**
	(0.39)	(0.39)		(0.39)
comlang_off	1.71***	1.77***		1.70***
	(0.58)	(0.58)		(0.58)
colony	-0.77	-0.78		-0.76
	(0.57)	(0.57)		(0.57)
ln_dist	-0.00078*	-0.00079*		-0.00078*
	(0.00041)	(0.00041)		(0.00041)
ln_Access$_r$	-0.13			
	(0.26)			
ln_Access$_p$	-0.021			
	(0.29)			
ln_COM$_r$		-0.14		
		(0.23)		
ln_COM$_p$		0.33		
		(0.23)		
ln_LEX$_r$			1.18*	
			(0.70)	
ln_LEX$_p$			0.67	
			(0.64)	
ln_OverallLib$_r$				-0.18
				(0.34)
ln_OverallLib$_p$				-0.045
				(0.35)
Constant	-25.4***	-25.9***	-27.9	-25.3***
	(8.68)	(8.72)	(21.7)	(8.66)
Observations	443	443	428	443
R^2			0.090	
AIC	.	.	1088.3	.
BIC	.	.	1145.2	.
Hausman Test	0.159	0.079	0.006	0.086

Standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01

5.2.3. Rail Freight Transport Services (BOP Code 221)

Table 5.4 – Regression of Rail Freight Transport

	(9)	(10)	(11)	(12)
Type of Estimation	**FE**	**FE**	**FE**	**FE**
Dependent:	Im_{irp}	Im_{irp}	Im_{irp}	Im_{irp}
ln_Inv$_r$	-0.15	-0.11	-0.14	-0.14
	(0.12)	(0.12)	(0.12)	(0.12)
ln_Main$_r$	-0.11	-0.11	-0.12	-0.11
	(0.096)	(0.095)	(0.095)	(0.096)
ln_Inv$_p$	0.18	0.11	0.23*	0.17
	(0.12)	(0.12)	(0.12)	(0.12)
ln_Main$_p$	0.036	0.044	0.049	0.043
	(0.087)	(0.086)	(0.087)	(0.087)
rail_dens$_r$	-41.6*	-45.1**	-39.1*	-39.5*
	(22.9)	(22.7)	(23.0)	(22.9)
rail_dens$_p$	-16.6	-14.5	-15.5	-18.3
	(21.1)	(21.0)	(21.1)	(21.1)
ln_diff_GDP	0.055	0.058	-0.037	0.058
	(0.14)	(0.14)	(0.14)	(0.14)
ln_GDP$_r$	0.58	0.82	0.35	0.51
	(0.52)	(0.50)	(0.54)	(0.53)
ln_GDP$_p$	-1.17**	-1.39**	-0.91	-1.04*
	(0.54)	(0.54)	(0.56)	(0.55)
ln_Ex$_{rp}$	0.26	0.23	0.25	0.26
	(0.17)	(0.17)	(0.17)	(0.17)
ln_Im$_{rp}$	0.39*	0.42**	0.38*	0.38*
	(0.21)	(0.21)	(0.21)	(0.21)
ln_Access$_r$	0.070			
	(0.23)			
ln_Access$_p$	0.084			
	(0.24)			
ln_COM$_r$		-0.30		
		(0.24)		
ln_COM$_p$		0.46*		
		(0.24)		
ln_LEX$_r$			0.68*	
			(0.37)	
ln_LEX$_p$			-0.70*	
			(0.38)	
ln_OverallLib$_r$				0.25
				(0.30)
ln_OverallLib$_p$				-0.16
				(0.31)
Constant	9.59	9.08	10.3	8.35
	(10.5)	(10.3)	(11.0)	(10.8)
Observations	851	851	826	851
R^2	0.041	0.047	0.051	0.042
AIC	1832.0	1826.3	1764.8	1831.2
BIC	1898.4	1892.7	1830.8	1897.6
Hausman Test	0.000	0.000	0.000	0.000

*Standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01*

Table 5.4 shows the estimation results for the Rail Freight Transport category (BOP: 221). According to the Hausman test, all specifications are preferred to be estimated using FE regression. Among all liberalization indices, LEX index for the reporter country has statistical

positive significant coefficient. On the other hand, the same index for the partner country receives negative significant coefficient.

Similar to the results for rail passenger transport, infrastructure investment and maintenance for both countries are not statistically significant in all four equations. Similar to almost all previous regressions, railroad density in the reporter country has statistical negative significant coefficients in all of the specifications in the below table, and railroad density in the partner country has no statistical significant coefficients in any of the specifications.

Similar to the regressions over the whole rail transports, export of goods has no significant relationship with the import of freight transports, while import of goods significantly increases the import of freight transport services. The last result is in line with standard expectations.

5.2.4. Other Rail Transport Services (BOP Code 222)

Table 5.5 shows the estimation results for Other Rail Transport category (BOP: 222). According to the Hausman test, specifications (14) and (15) are preferred to be estimated using FE technique, while specifications (13) and (16) are better to be estimated with RE regression. Among all liberalization indices, only LEX index for the reporter country has a statistically positive significant coefficient. This result in addition to previous results cannot considerably determine a clear relationship between liberalization efforts and other rail transports.

Similar to the results for rail passenger and rail freight transports, infrastructure investment and maintenance variables for partner country have no statistical significant coefficients in all four specifications. However, investment in rail infrastructures of the reporter country statistically significantly decreases the import of other rail transports according to the RE regression results. Maintenance of the railroads in the reporter country increases the import of these services given the RE estimation results.

Similar to previous regressions, railroad density in the reporter country has statistical negative significant coefficients in the two RE regressions. We already tried to interpret this non-intuitive result. Railroad density in the partner country receives statistically significant coefficient in specification (15) only.

The same as regressions over rail passenger and freight transports, differences in real GDP of both partners have no specific relationship with the import of other rail transport services. However, unlike those last regressions, nominal GDP of the reporter country has statistical significant positive coefficients in three columns of the following table. Similar to the whole rail transports, nominal GDP of the partner country has no statistically significant influence on the import of other rail transports.

Export and Import of goods have no significant relationship with the import of other transports. Among geographical CEPII variables, only contiguity receives statistically significant positive coefficients in the two RE regressions, which can be interpreted similarly to the results obtained in rail freight transports.

Table 5.5 – Regression of Other Rail Transport

	(13)	(14)	(15)	(16)
Type of Estimation	**RE**	**FE**	**FE**	**RE**
Dependent:	Im_{irp}	Im_{irp}	Im_{irp}	Im_{irp}
ln_Inv$_r$	-0.38**	-0.39	-0.27	-0.38**
	(0.19)	(0.25)	(0.24)	(0.19)
ln_Main$_r$	0.21*	0.13	0.095	0.21*
	(0.11)	(0.18)	(0.17)	(0.11)
ln_Inv$_p$	0.18	0.11	0.29	0.19
	(0.22)	(0.29)	(0.28)	(0.22)
ln_Main$_p$	-0.046	0.11	0.080	-0.045
	(0.12)	(0.21)	(0.21)	(0.12)
rail_dens$_r$	-11.5*	9.78	29.1	-11.2*
	(6.50)	(50.2)	(48.9)	(6.51)
rail_dens$_p$	-5.62	-73.8	-80.5*	-5.78
	(6.49)	(45.3)	(44.6)	(6.49)
ln_diff_GDP	0.089	-0.10	-0.078	0.093
	(0.14)	(0.27)	(0.26)	(0.14)
ln_GDP$_r$	0.79**	2.62**	1.25	0.76**
	(0.36)	(1.30)	(1.29)	(0.36)
ln_GDP$_p$	-0.18	0.72	0.048	-0.20
	(0.38)	(1.39)	(1.41)	(0.38)
ln_Ex$_{rp}$	0.28	-0.73	-0.55	0.26
	(0.35)	(0.73)	(0.71)	(0.35)
ln_Im$_{rp}$	0.36	-0.75	-0.76	0.38
	(0.35)	(0.77)	(0.76)	(0.35)
contig	1.70***			1.71***
	(0.56)			(0.56)
comlang_off	-1.85			-1.84
	(1.61)			(1.61)
colony	-0.60			-0.60
	(0.91)			(0.91)
ln_dist	-0.00088			-0.00086
	(0.00057)			(0.00057)
ln_Access$_r$	-0.23			
	(0.39)			
ln_Access$_p$	-0.080			
	(0.40)			
ln_COM$_r$		-0.24		
		(0.50)		
ln_COM$_p$		0.61		
		(0.53)		
ln_LEX$_r$			2.24**	
			(0.90)	
ln_LEX$_p$			0.36	
			(0.85)	
ln_OverallLib$_r$				-0.10
				(0.53)
ln_OverallLib$_p$				-0.10
				(0.53)
Constant	-23.1**	-63.5**	-30.1	-22.5**
	(11.3)	(29.8)	(31.5)	(11.3)
Observations	319	319	319	319
R^2		0.082	0.109	
AIC	.	862.5	853.2	.
BIC	.	915.2	905.9	.

Standard errors in parentheses; * p < 0.10, ** p < 0.05, *** p < 0.01

5.2.5. Overview of the results

In the above subsections, we analyzed the determinants of bilateral trade in rail services. We included four indices of market liberalization in rail transport services as the explanatory variables of the regressions.

Among all of these indices, only the First Level Liberalization Index (LEX) in the reporter (importing) country received significant positive coefficients in all regressions. This index shows the existing legal framework (law in the books). In other words it describes what are the legal requirements for market entry and to what extent does a regulatory authority support external Railway Undertakings (RU). These results suggest that more liberalized legal framework indeed helps imports (trade) of rail services. However, our study did not reveal a clear relationship between remaining liberalization indices and trade in rail transport services.

5.3. Quantification of Restrictiveness of Policy in the Rail Transportation Sector Using the Gravity Approach

While measuring the possible impact of trade liberalization in specific services trade sectors it is essential to control for changes in the liberalization level. This can be done by introducing specific liberalization indices as explanatory variables into the econometric model, just as in the study presented in the previous section. However, one of the main drawbacks of such approach is that majority of indices that could be implemented in similar studies is available only for specific years. In the example presented above the IBM, Global Business Services Rail Liberalization Indices were available only for years: 2002, 2004, 2007 and 2011. There is no continuity over time, which may significantly hinder the reliability of such variables in the context of panel data studies.

Another possible approach to assess trade liberalization is to infer the level of liberalization from the actual trade flows and compare them to the reference trade flows generated from the theoretical, frictionless model of trade. Such an approach has been analyzed and discussed in various studies, including Park (2002), Francois (2005) and Walsh (2006). In this section, we estimate tariff equivalents in imports of rail transportation services and analyze them over time to assess the degree of trade liberalization in the period under consideration. Moreover, it will be analyzed whether or not the liberalization efforts led to clear reduction of those estimated equivalents.

Following the suppositions of the model applied by Anderson and van Wincoop (2003), it is assumed that products are differentiated by country of origin and that there are trade costs to international trade. Consequently, the gravity equation takes the following general form:

$$x_{rp} = \frac{Y_r Y_p}{Y^w} \frac{\tau_{rp}^{-\sigma}}{P_r^{1-\sigma}\,\varphi} \tag{5.2}$$

The nominal bilateral services trade flow from partner country p to reporter country r (x_{rp}) is related to the exporting and importing countries' GDP (Y_p and Y_r respectively) where P_r denotes

the price index in country *r*, φ represents the exporter's price index which according to Park (2002) is a suitable proxy for Anderson and van Wincoop's (2003) multilateral resistance terms, and σ is the elasticity of substitution between sources of imports (Armington elasticity). The bilateral trade costs influencing the trade flow between a pair of countries is denominated as τ_{rp}. If σ>1, then a higher trade barrier will negatively influence the volume of trade.

Anderson and Wincoop (2003) assumed existence of symmetrical trade costs between pairs of countries, i.e. they assumed $\tau_{rp} = \tau_{pr}$. Nevertheless, in this paper, following Park (2002) it is assumed that a country has single trade barrier imposed on all trade partners, i.e. $\tau_{rk} = \tau_k$. These trade costs, following the assumptions introduced by Bergstrand (1985) and Anderson Wincoop (2003), consist of two components, which are the bilateral distance between the two partners (d_{rp}) and the trade barriers (t_r). Therefore, the trade cost takes the form of:

$$\tau_{rp} = t_r^{k_{rp}} d_{rp}^{\rho} \tag{5.3}$$

where k_{rp} equals 0 if *r* equals *p*, which indicates that they are the same country in which case no additional tariff to trade is present and ρ represents the extent to which distance affects trade. The trade barrier *t* equals 1 plus the country *r*'s tariff equivalent.

The empirical problem in this case is associated with measuring the barriers to trade in services (t_r), which cannot be directly observed. Following Park (2002) an indirect method of computing this term is applied. In order to specify the significance of this term, it is required to compare the observable, empirical trade flows with the hypothetical trade value that should take place under assumption of frictionless conditions to trade. The difference between the two values should indicate the level of existing trade barriers that causes distortion of empirical trade flows as compared to theoretical predictions.

In order to capture the information on most probable expected trade flows, it is necessary to identify a set of variables that combined constitute a reliable gravity model. The variables should enable controlling for specific aspects of rail transportation services, such as the development of rail infrastructure and a country level demand for such services. Additional binary variables describing the impact of common language and other regional characteristics influencing the propensity to trade between a pair of countries should also be included in the analysis. However, under assumption of fixed effects model, their impact will be assessed by the assumption of existence of fixed effects among pairs of countries. Consequently, the final equation might be written as:

$$\begin{aligned} \ln Im_{irpt} = c + \beta_1 \ln GDP_{rt} + \beta_2 \ln GDP_{pt} + \beta_3 \ln dist_{rp} \\ + \beta_4 \ln(diff\_GDP_t) + \gamma_1 Z_{irpt} + \varepsilon_{irpt} \end{aligned} \tag{5.4}$$

where Im_{irpt} is the import of rail transport service *i* by reporter country *r* from the partner country *p* at time *t*, c refers to the intercept term, GDP_{rt} represents the nominal *GDP* in year t of country *r* (or p respectively) measured in US Dollars, $diff\_GDP_t$ determines the difference of real GDP per capita in US Dollars between the two countries, $dist_{rp}$ defines the distance between the two partners in kilometers, and Z is a vector of control variables.

In order to evaluate the possible impact of volume of goods trade as a source of demand on rail transportation services flows between a pair of countries, the data on the value of imported goods (Im_{rp}) was included in the study. The development of physical infrastructure was captured by information concerning the density of rail infrastructure measured as total lines divided by the area of the country. Additionally it was aimed to capture information on the country-specific demand on rail transport services by introduction of variables describing total number of rail passengers and total value of goods transported by rail in a given country.

Table 5.6 – Data description

Variable	Description	Source
ln_Im$_{irp}$	Import of Transport Services – USD Millions	TSDv8.7database provided by Francois and Pindyuk (2013)
	Service i (EBOPS Code 219): Total Rail transport	
ln_Inv	Infrastructure Investment – EUR Millions	International Transport Forum at the OECD (can be found at: http://www.internationaltransportforum.org/statistics/investment/data.html)
ln_rail_dens	Rail lines (total route-km) divided by the Area of the country (sq. km)	Own Calculations – Data from World Development Indicator
ln_passengers	Railways, passengers carried (mln passenger)	Own Calculations – Data from World Development Indicator
ln_freight	Railways, goods transported (mln ton km)	Data from World Development Indicator
ln_diff_GDP	Difference of GDP per capita (constant 2000 USD) between the two countries	World Development Indicator
ln_GDP	GDP (current USD)	World Development Indicator
ln_Im$_{rp}$	Total Import of goods to Reporter from Partner – Thousands USD	World Integrated Trade Solution (WITS) - UN COMTRADE
ln_distcap	Distance between the capital cities of the two countries in km	CEPII database
Contig	Contiguity of the two countries	CEPII database
comlang_off	Common official language in the two countries	CEPII database

The time period for which the analysis was conducted is restricted to years from 2003 to 2010 due to limited data availability. It is both due to constricted data on bilateral trade flows of services and due to lacking of continuous data on transport infrastructure. Consequently, the presented analysis is based on an unbalanced panel database for 29 countries, mostly European. The analysis is based on the same database as the study presented in the first part of the chapter. Therefore, the dependent variable Im_{irpt} is obtained from TSDv8.7 database provided by Francois and Pindyuk (2013). The control variables describing the time-invariant relations between country pairs and geographical gravity variables were gathered from CEPII[64]. Im_{rp} is UN COMTRADE data collected from World Integrated Trade Solution (WITS)[65]. Infrastructural variables are collected from International Transport Forum at the OECD[66]. The

[64] Centre d'Études Prospectives et d'Informations Internationales and Can be found at: http://www.cepii.com/anglaisgraph/bdd/distances.htm
[65] Can be found at: https://wits.worldbank.org/
[66] Can be found at: http://www.internationaltransportforum.org/statistics/investment/data.html

rest of the variables are collected from the World Development Indicators (WDI) provided by the World Bank[67]. Table 4.6 presents the complete data description.

Table 5.7 presents the coefficient estimates and their significance under assumption of occurrence random effects (RE) and fixed effects (FE) among pairs of countries. The conducted Hausman test for the study suggests that the preferable model in this case should be the fixed effects model.

Due to the fact, that information on the total number of passengers carried by rail transport proved to be insignificant under fixed effects model, and the removal of these variables, both with the respect to the importing as well as to the exporting country, did not cause a major change in the value of adjusted R-squared, they were omitted in the final study.

The estimated variables of the gravity model are in majority of cases in line with the expectations. The positive impact of contiguity and negative impact of distance has been expected. The positive impact of trade in goods on rail freight has also been expected. Finally, the GDP level had, at least in some specifications, positive impact of rail transportation.

The correct estimation of proper set of variables enabling construction of a reliable gravity model is essential for further analysis aimed at estimating the tariff equivalents for rail transportation services. The knowledge of the variables enables conduction of series of analyzes focused on predicting the most probable trade flows.

In order to obtain the estimates for tariff equivalents some constraints have to be imposed on the above equation: The sum of residuals ε_{irpt} for a given importing country in a given year should be equal to 0 and the sum of all residuals for a given year must also be equal to 0.

Following Anderson and Wincoop (2003) and Park (2002) we assume that the residual ε_{irpt} is defined as the difference in log values of actual and predicted export value from country *p* to country *r*. The difference between the total predicted value of country imports and total observed import flows are assumed to indicate the level of distortion to trade caused by existence of trade barriers. The absolute differences should be then normalized relative to a benchmark free-trade country case, where the trade volume is least distorted. Then the relative trade barrier (t_r) in transportation services sector *i* for a given country in a given year can be measured on the basis of the following relation:

$$-\sigma \ln t_r = \ln \frac{X_r^a}{X_r^p} - \ln \frac{X_b^a}{X_b^p} \tag{5.5}$$

The indices *a*, *p* and *b* represent the actual, predicted and benchmark trade volumes. The σ is the elasticity of substitution between sources of imports (Armington elasticity) of a given service. X_r^a is then the country *r*'s observable value of imports. Countries for which the total difference between the actual and predicted value of imports is negative and has greatest absolute value are assumed to be most restrictive. The most liberalized country in the sample, that is the country with greatest actual trade volumes relative to the predicted values, is the

[67] Can be found at: http://data.worldbank.org/data-catalog/world-development-indicators

Great Britain in the year 2007. Therefore, it was regarded as the benchmark country in further analysis.

Table 5.7 – Gravity model estimation results

VARIABLES	(1) RE	(2) FE	(3) RE	(4) FE
ln_Im$_{rp}$	0.352***	0.152	0.384***	0.131
	(0.0852)	(0.132)	(0.0836)	(0.129)
ln_GDP$_r$	-0.140	-0.0920	0.108	0.104
	(0.169)	(0.392)	(0.135)	(0.377)
ln_GDP$_p$	-0.126	-0.0134	-0.242**	-0.0649
	(0.137)	(0.266)	(0.122)	(0.260)
ln_inv_rep	0.0751	-0.0527	0.0811	-0.0743
	(0.0841)	(0.100)	(0.0831)	(0.0986)
ln_inv$_p$	0.166**	0.251***	0.137*	0.215**
	(0.0793)	(0.0899)	(0.0775)	(0.0878)
ln_diff_GDP	0.122**	0.0877	0.0822	0.0690
	(0.0599)	(0.101)	(0.0577)	(0.0978)
ln_dens$_r$	-0.173	-2.442***	-0.00145	-0.801*
	(0.141)	(0.885)	(0.111)	(0.409)
ln_dens$_p$	0.441***	-1.340	0.376***	-0.968
	(0.130)	(0.875)	(0.122)	(0.781)
ln_passangers$_r$	0.272**	0.231		
	(0.114)	(0.233)		
ln_passangers$_p$	-0.0920	0.193		
	(0.0744)	(0.145)		
ln_freight$_r$	0.0921	-0.0737	0.116*	-0.0251
	(0.0664)	(0.111)	(0.0614)	(0.108)
ln_freight$_p$	0.274***	0.283***	0.266***	0.298***
	(0.0626)	(0.0846)	(0.0558)	(0.0827)
contig	1.383***		1.368***	
	(0.339)		(0.340)	
comlang_ethno	0.687		0.713	
	(0.475)		(0.478)	
ln_distcap	-0.736***		-0.663***	
	(0.170)		(0.164)	
Constant	0.987	-18.14**	-1.262	-11.85*
	(3.597)	(7.251)	(3.460)	(6.643)
Observations	1,508	1,508	1,555	1,555
R-squared		0.035		0.029
Number of pair	351	351	368	368
Adj. R-squared	0.528	-0.270	0.518	-0.282

*Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1*

In order to compute the final trade restrictiveness indices an additional assumption regarding the constant elasticity of substitution is required. Following the assumption made by Park (2002) we apply value of 5.6 as representing σ. being the most likely consumer preferences, characteristic for most services sectors.

As shown above, the reference estimations of the gravity equation were performed for the pooled sample in a panel form to account for unexplained heterogeneity. However, in order to

account for the time variation in the tariff equivalents, a cross-section version of the equation was estimated for each of the sample periods. In this manner, the time-varying importer-specific fixed effects were estimated and they were subsequently used to compute the time series of tariff equivalents.

Table 5.8 – Estimated tariff equivalents in rail transportation services sector

Country	2003	2004	2005	2006	2007	2008	2009	2010	Mean	Var
AUS	0,58		0,61	0,99	0,30	0,44	0,56	0,45	0,56	0,040
AUT	0,31	0,32	0,28	0,30	0,26				0,29	0,000
BEL	0,55	0,57	0,67	1,18	0,36	0,44	0,44		0,60	0,065
BGR	0,62	0,63							0,62	0,000
CAN			0,54	0,48	0,34	0,48	0,57	0,69	0,52	0,011
CHE	0,38	0,36	0,39	0,39	0,39				0,38	0,000
CZE	0,78	0,70	0,67	0,77	0,79	0,61	0,55	0,59	0,68	0,007
DEU	0,99	0,96	0,72	0,78	0,70	0,58	0,53	0,44	0,71	0,033
DNK	0,42	0,45							0,43	0,000
ESP	0,56	0,64	0,90	0,75	1,32	0,56	0,70	0,92	0,79	0,056
EST	0,30	0,31	0,21	0,23	0,11	0,38		0,30	0,26	0,007
FIN	0,53	0,48	0,86	0,89	0,70	0,53	0,41	0,36	0,60	0,035
FRA	0,45	0,45	0,51	0,35	0,36	0,47	0,41	0,50	0,44	0,003
GBR		0,07	0,12	0,12	0,00	0,33			0,13	0,012
HRV	0,46	0,50	0,45		0,16	0,74	0,46	0,89	0,52	0,047
HUN	0,34	0,24	0,81	0,49	0,77	0,56	0,30	0,23	0,47	0,047
ITA	0,59	0,64	0,54	0,61	0,61	0,52	0,48		0,57	0,003
JPN	0,46	0,39	0,30	0,47	0,51	0,61	0,58	0,40	0,47	0,009
LTU	0,77	0,85	0,91	1,35	0,60	0,83	0,64	0,65	0,83	0,050
LUX			0,63	0,65	0,60	0,39	0,51		0,56	0,009
LVA	0,37	0,35	0,33	0,39	0,20	0,17	0,64	0,56	0,38	0,023
POL	0,38	0,39	0,41	0,52	0,46	0,55	0,69	0,63	0,50	0,011
PRT	0,86	0,79	0,51	0,24	0,58	0,61	0,59	0,57	0,59	0,030
ROU	0,44	0,36	0,29	0,27	0,43	0,61	0,66	1,29	0,54	0,096
RUS	0,81	0,86	0,70	0,30	0,72	0,37	0,09	0,32	0,52	0,071
SVK	0,34	0,26	0,20	0,44	0,35	0,28	0,35	0,25	0,31	0,005
SVN	0,74	0,93	0,75	0,46	0,87	0,73	0,79	0,79	0,76	0,017
SWE	0,47	0,53	0,54	0,48	0,68	0,59			0,55	0,005
TUR	0,21	0,36	0,54	0,36	0,70	0,59	0,45	0,68	0,49	0,026
Mean	0,52	0,52	0,53	0,55	0,50	0,52	0,52	0,58		
Var	0,04	0,05	0,05	0,09	0,07	0,02	0,02	0,06		

Source: own calculations

Table 5.8 presents the measured relative restrictiveness indices for transportation services sector for a group of European countries during 2003-2010. In addition to the indices themselves, the table shows the unweighted averages and variances of indices for all countries in a given year in the last two rows of the table, and for a given country for all available years in the two most right columns of the table. The differences in the level of restriction are greater between

countries in a given year than within one country over the time period. This observation is consistent with expectations – there are obvious differences in the state of legislation and rail services sector development among countries and the state of restrictiveness in a given country is not an attribute subject to significant changes under a limited time period.

One has to remember that presented outcomes refer to relative differences in restrictiveness levels, not to the absolute values. Therefore, the fact that in this data, Great Britain in year 2007 is defined as the country with 0% restrictions to trade in the sector indicates that this country was experiencing most liberalized market compared to other countries in the sample, not that there were literally no restrictions in this country.

The results presented in the Table 5.8 demonstrate large differences in tariff equivalents among the analyzed countries. In general the countries with higher liberalization indices (indicating more liberal regimes, which will be discussed in the next section), like Great Britain (GBR), Denmark (DNK), Sweden (SVN) or Germany (GER) reveal lower level of tariff equivalents. There are, however, exceptions from that rule. For example, Ireland, France, or Latvia have relatively low indices of liberalization, while the tariff equivalents are not very high. Thus, we can conclude that institutional liberalization reforms have some impact on the level of tariff equivalents but this is not a one-to-one type of relationship.

The empirical analysis, based on gravity model, did not reveal a clear downward trend in the levels of tariff equivalents, presumably reflecting existing trade barriers, between EU and OECD countries. Therefore, we cannot detect a clear downward trend. It has to be noted that there are some countries, such as Germany where the liberalization trend in tariff equivalents is clearly observed. On the other hand there are also countries in which the tariff equivalents increased over the period 2002-2010. Poland and Turkey are among those countries. These results are somewhat surprising given the three rail liberalization packages that have been adopted by the EU countries. The estimated trade equivalents that are not going down over time, may suggest a slow progress in enforcement of liberalization policies.

5.4. Conclusion and Policy Recommendations

The economic analysis of the institutional liberalization was concentrated on the rail sector. We used four indices measuring the market liberalization in rail transport services, elaborated by the IBM Consulting Services, as the main explanatory variables of the regressions. Among all of these indices, only the LEX of the importing country turned out to be significant and positive coefficients in all regressions. This index quantifies the legal requirements for market entry and to the extent of the support of the regulatory to the external Railway Undertakings. Our results suggest that among all the measures, only the liberalization of the legal framework has had a significant impact on the volume of imports.

Thus, on the basis of the LEX index, we can conclude that a more independent status of incumbents from the states, higher degree of a vertical separation of network and operations, and a higher degree of horizontal separation freight/passenger transport has a positive impact on trade flows. In the same way, easier market access for foreign and domestic railway

undertakings and easier legal access to operational facilities has positive economic implications. On the other hand, results obtained using an alternative empirical approach, based on a gravity model, did not reveal a clear downward trend in the levels of trade barriers between EU countries and OECD countries over the analyzed period.

The subject of trade barriers in services sectors is of a complex nature. The restrictions in services are of qualitative nature, which makes it hard to conduct empirical research on the matter of possible impacts of progressing liberalization. Therefore it is crucial to develop methods enabling creation of indices describing the likely level of restrictions in a given services sector. Additionally, since many studies assume panel data analysis, there is a need for such restrictiveness indices presented in a form of a time series.

6. The impact of NTMs in global value chains

Abstract: In this chapter, we examine the impact of non-tariff measures (NTMs) on trade between countries at the 6-digit level of the Harmonized System over the period 2002-2011. We draw on the existing information on NTM notifications to the WTO from the Integrated Trade Intelligence Portal (I-TIP) distinguishing various NTMs, e.g. technical barriers to trade and sanitary and phytosanitary measures. Following the existing literature (e.g. Kee et al., 2009) a gravity approach is chosen to assess whether NTMs facilitate or impede trade across countries. This approach allows calculating implied ad-valorem equivalents (AVEs) for NTMs, which will be differentiated by NTM types, country groups, industries, and product categories. Furthermore, the effects of NTMs are distinguished by the broad economic categories (BEC) classification, which allows assessing whether the effects of NTMs differ for intermediary products or final goods.

6.1. Introduction

The general trend towards an increasing use of non-tariff measures (NTMs) as specific trade policy measures, the abrupt increase in using these trade policy instruments during the recent financial crisis and its importance in the negotiations of recent trade agreements stimulated discussions on the political economy of NTM use. With respect to exports of developing countries, the launch of the Sustainable Development Agenda in September 2015 might anew boost research in this field beyond advanced economies.

The recurrent question is whether – or to which extent – NTMs are misused to protect domestic producers while policy makers pretend to act for the protection of consumers and the environment. Many studies focus on the trade effects for specific products, resulting from the imposition of one specific NTM for a group of countries. For example, Disdier et al (2008) find that EU sanitary and phytosanitary measures (SPS) and technical barriers to trade (TBT) are more trade restrictive than any other OECD standards. Further, Kee et al (2009) evaluated the restrictiveness of NTMs for 78 countries and 4,575 goods at the HS 6-digit-level. Their findings underpin the view that NTMs serve as tariff substitutes rather than tariff complements. In addition, they find greater trade impeding effects for the agricultural sector than for the manufacturing sector. Kee et al (2009) restrict non-tariff measures to be non-tariff barriers, i.e. to have a negative impact on trade, by imposing several parameter restrictions.

However, in the presence of information asymmetries, the imposition of standard-like NTMs – e.g. a minimum quality standard – can increase consumer trust, decrease transaction costs, and promote trade. Furthermore, exporters differ in their capacities to cope with new standards. Therefore, the implementation of a new NTM that is applicable to exporters and domestic producers reduces exports of some, increases exports of others, and might in the end increase the imports of the NTM imposing country. Bratt (2014) and Beghin et al. (2014) therefore, allow also for trade-promoting effects of NTMs, which respectively find for 46% and 39% of the HS 6-lines affected.

Yet, none of the mentioned studies allows for a differentiation of NTM types. This chapter aims to fill this gap by using a rich data compilation of WTO notifications. The WTO provides comprehensive data on NTM notifications within the Integrated Trade Intelligence Portal (I-TIP). Ghodsi, Reiter, and Stehrer (2015) have improved this database by matching missing HS codes to the notifications. This paper distinguishes between four categories of NTMs: antidumping (ADP), sanitary and phytosanitary measures (SPS), technical barriers to trade (TBT) and other quantitative measures including safeguards, special safeguards, countervailing duties and quantitative restrictions (QNTM). Furthermore, working with this unique dataset allows evaluating the trade effects of NTMs by means of an intensity measure, i.e. by counting how many NTMs a specific importing country imposed against a trading partner in each year on each HS 6-digit product.

Using the number of each NTM type imposed at each product, we estimate the impact of these trade policy measures on the bilateral import flows of products to the NTM imposing country using a gravity framework. Allowing for both trade promoting and trade impeding effects of NTMs, we calculate the ad-valorem equivalent (AVE) of each product-specific NTM type for each imposing country for the period 2002-2011. The remainder of this chapter is structured as follows. Section 2 gives a brief overview on the literature. Section 3 describes our methodology and data to estimate AVEs with empirical results presented in Section 4. The final section concludes.

6.2. Literature Review

The number of NTMs reported to the WTO has tripled from 1995 to 2010 and has quadrupled until 2012. The enormous speed with which NTMs spread as trade policy instruments is reflected in the fast growing literature on their economic effects. Ferrantino (2006) offers a detailed description of methods frequently used to quantify the effects of NTMs by NTM type. Partial equilibrium frameworks (Van Tongeren et al., 2009; Beghin et al., 2012; and Ghodsi, 2015b), computable general equilibrium models (Andriamananjara et al., 2004; Francois et al., 2011; and Raza et al., 2014), gravity estimations (Essaji, 2008; Disdier et al., 2010; Yousefi and Liu, 2013; and Ghodsi, 2015c), and the calculation of ad-valorem equivalents (AVE) for NTMs (Kee et al., 2009; Bratt, 2014; and Beghin et al., 2014) are methods of assessing the NTMs' impact on international trade.

In light of the political discussions on whether NTMs feature as substitutes for tariffs some authors have analyzed the substitutability and/or complementarity of tariffs with NTMs and other trade policy instruments (Yu, 2004; Moore and Zanardi, 2011; Aisbett and Pearson, 2013; and Ghodsi, 2015a). However, NTMs with their complex and opaque nature cannot be easily compared with tariffs that are imposed either in ad-valorem rates or in fixed price charges. Therefore, many authors aim to make their effects directly comparable to tariffs by computing the AVE of NTMs. Currently there are two approaches most commonly applied in the literature.

One method is to analyze the price wedge resulting from the implementation of NTMs (Dean et al., 2009; Rickard and Lei, 2011; and Nimenya et al., 2012). The amount of information

necessary for this analysis restricts most of the papers to the analysis of very few – mainly agricultural – products for a small set of countries. The paper by Dean et al. (2009) is a rare exception. Other drawbacks of this method are that domestic prices in the absence of NTMs are not observable. Therefore, domestic prices affected by NTMs are often directly compared to international prices, neglecting the possible impact of differences in product quality. Furthermore, NTMs occur at different stages along the supply chain, which makes a comparison of different prices along the production and distribution chain (e.g. CIF, DDD) for a single product necessary. In addition, in the case of prohibitive NTMs, no prices are observable at all.

The other branch of literature has been triggered by a contribution from Kee et al. (2009), who infer the AVEs of NTMs indirectly in a two-step approach. They assess the impact of NTMs on the import values with a gravity model. The results are then converted to AVEs using import demand elasticities, which are estimated beforehand. They find that the average AVE of all products affected by NTMs is 45%, and 32% when weighted by import values. For 55% of affected products, the AVE of the NTM has a higher effect than its corresponding tariff. Furthermore, they report a great variation of AVEs across products and countries. The average AVE was found to be 17 percentage points higher for the agricultural sector compared to the manufacturing sector. The highest average AVE aggregated at HS-2-digit level was shown for dairy products, where an average AVE of NTMs of 46% together with an average tariff of 29% leads to an overall protection level of 75%. The lowest average AVE was reported for tin and tin products, with an average AVE of NTMs of 3% and an additional average tariff of 9% leading to an overall protection level of 9%. Differentiating across NTM-imposing countries, the highest AVEs for NTMs were observable for low-income countries in Africa, whereas countries with the highest AVEs for domestic support were members of the European Union. Accounting for product and country fixed effects Kee et al. (2009) conclude that NTMs are serving as substitutes to tariffs.

Kee et al (2009) restricted their AVEs to be positive, i.e. forcing NTMs to have only trade restrictive effects comparable to tariffs and quotas. Given market imperfections, NTMs can however, also serve to facilitate trade. Beghin et al. (2014) therefore, re-estimate the gravity approach proposed by Kee et al. (2009) for standard-like NTMs for the years 2001 to 2003, allowing for positive and negative values of AVEs of NTMs. In their analysis, 12% of all products at the HS-6-digit level were affected by regulations. Out of these, 39% exhibited negative AVEs – i.e. an import-facilitating effect. In a similar analysis, Bratt (2014) concludes that overall, NTMs impede rather than facilitate trade, with a median AVE of 15.7%. However, 46.1% of all AVEs computed show a positive effect on trade. Distinguishing between exporters and importers at different income levels, as well as between the food and the manufacturing sector, he finds that the effects of NTMs are in the first instance driven by the NTM imposing countries, where AVEs on NTMs are highest for low-income countries for both sectors. Only within these groups, the heterogeneity of exporters in how to cope with the imposition of NTMs seems to matter. Bratt (2014) highlights that NTMs in food sector are more trade restrictive than NTMs in the manufacturing sector. Within the food sector, low-income exporters face the lowest AVEs on NTMs, irrespective of the importing group. Low-income exporters are also

confronted with the lowest AVEs of NTMs imposed by high-income countries for both the food and manufacturing sector.

The main advantage of the gravity approach in comparison with the price wedge approach is that the former relies on trade data, which is more abundant at the disaggregated product level than price data. In addition, it can be used for broad panel analysis, i.e. for a big set of countries and products, with different NTMs and longer periods. Yet, the indirect approach has drawbacks too. Like the price gap method, this approach does not distinguish the quality of domestic from foreign goods, influencing the impact of NTMs.

This chapter aims to fill gaps in the literature of AVE calculation. Previous calculations of AVE of NTMs (Kee et al., 2009; Bratt, 2014; and Beghin et al., 2014) were conducted on cross sectional data due to lack of information on NTMs. Having a rich database on NTMs obtained from WTO I-TIP we are extending their approach to a panel analysis which firstly provides more efficient estimators, and secondly accounts for the effects of NTMs after their impositions over the period considered. Moreover, previous calculations were not distinguishing NTM types whose diverse attributes by motives would bring various trade consequences. In this article, we differentiate four major categories of NTMs, which can provide better insights on the implications of different NTMs. In addition, in previous studies, intensity of NTMs was not considered and existence of NTMs captured by employing dummy variables. In contrast, our analysis is based on the intensity of NTM types by counting the number of imposed NTMs. The prominent contribution of this study relies on the variation of NTM effects by importer countries. In previous studies, the empirical approach gave an average impact of NTM on the import of products to all importers. The variation in the calculated AVEs thus, depended mainly on the variations in the import demand elasticities, which by construction depended only on variation of product imports share to GDP across all importers. However, the novelty of this contribution is highlighted by both variations of import demand elasticities across importers and variations of NTM effects using the interaction approach discussed below.

6.3. Methodology and Data

Given the steadily rising number of various types of NTMs and the resulting intense political discussions surrounding their (potential) misuse as protectionist tools that erode the economic benefits of preceding cuts in tariff rates, it is desirable to make them directly comparable to tariffs. As mentioned in the literature review, there are two basic approaches, how to compute respective AVEs of NTMs. A direct approach would be the evaluation of differences in prices prior and after the NTM implementation (see e.g. Dean et al., 2009). Yet, this approach has two main drawbacks. First, accurate data on domestic and foreign prices are not readily available as different NTMs occur at different points along the supply chain. In the extreme case, given a prohibitive NTM, no price is observable at all. The indirect approach makes use of import demand elasticities and was developed by Kee et al (2009). It is a two-step analysis, where first a gravity model is used to estimate the impact of NTMs on import values, where the Heckman

procedure accounts for zero trade flows. In the second step, this effect is transformed into a price effect – i.e. the AVEs – using import demand elasticities.

We consider a balanced panel of bilateral trade flows of 149 importers (mainly WTO members) and all other trading partners at a 6-digit product level for the period from 2002 to 2011. Given the large number of zero trade flows, we make use of the Heckman two-stage estimation procedure to address the possible selection bias as follows:

$$Prob[Im_{ijht} > 0] = \alpha_{0h} + \alpha_1 \ln(1 + t_{ijht}) + \sum_{n=1}^{4} \alpha_{2n}\, NTM_{nijht} + \alpha_3 C_{ijt} + \omega_i + \omega_j + \omega_t + \epsilon_{ijht}, \quad \forall n \in \{ADP, SPS, TBT, QNTM\} \tag{6.1}$$

$$\ln(m_{ijht} | m_{ijht} > 0) = \beta_{0h} + \beta_1 \ln(1 + t_{ijht}) + \sum_{n=1}^{4} \beta_{2n}\, NTM_{nijht} + \sum_{i=1}^{I} \sum_{n=1}^{4} \omega_i * \beta_{2ni}\, NTM_{nijht} + \beta_3 C_{ijt} + \omega_i + \omega_j + \omega_t + \phi_{ijht} + \mu_{ijht}, \quad \forall n \in \{ADP, SPS, TBT, QNTM\} \tag{6.2}$$

In a first step, the selection equation (6.1) evaluates the probability of non-zero trade flows for specific country pairs. From this first step, the inverse Mills ratio (ϕ_{ijht}) is obtained, which enters the outcome equation (6.2) in the second step as an explanatory variable. The outcome equation incorporates the coefficients capturing the impacts of tariffs (β_1) and non-tariff measures (β_{2n}, β_{2ni}) on imports, which in a final step are transformed to AVEs. In words, β_{2n} represents the average marginal impact of an additional imposed NTM of type *n* on the imports of one product for one reference importing country. In addition, β_{2ni} captures the importer-specific deviations from the reference country for each NTM type and product. Hence, the marginal impact of NTM type *n* of the *i*th importer on the log value of imports of product *h* is equal to $\beta_{2n} + \beta_{2ni}$.

Both equations are run separately for each product at the 6-digit level of the Harmonized System (HS). m_{ijht} denotes the imports of product h to country i from partner country *j* at time t. α_{0h} and β_{0h} represent product specific effects captured as constant terms. t_{ijht} is the tariff AVE (using UNCTAD 1 methodology[68]) imposed by the importing country i against the import of product *h* at time *t* from partner country *j*.

NTM_{nijht} are count variables for $n = 4$ different groups of NTMs: (1) anti-dumping (ADP), (2) sanitary and phytosanitary measures (SPS), (3) technical barriers to trade (TBT) and other quantitative measures (QNTM) encompassing safeguards (SG), special safeguards (SSG), countervailing duties (CV) and quantitative restrictions (QR). In order to obtain importer-specific AVEs of NTMs, we interact NTM variables with importer country dummies ω_i. C_{ijt} captures country-pair characteristics and consists of classical gravity variables and factor endowments. Gravity variables in our regressions are: dummy variables indicating whether both trading partners are EU members and WTO members; whether they are neighboring countries, whether they share a common ethnical language, whether they exhibit a common

[68] UNCTAD/WTO (2012)

colonial history, whether they belong to the same country (such as Taiwan or Hong Kong to China), or whether there is a Preferential Trade Agreement (PTA) in place. The distance between the capital cities of the trading countries enter in natural logarithm. These classical gravity variables are further supplemented by measures of factor endowments. Following Baltagi et al. (2003) and Ghodsi (2015c) we employ an index ranging from 0 to 0.5 depicting how different the trading partners are with respect to real GDP per capita, shown in equation (6.3). To account for the traditional market potential, we also include the sum of the trading partners' GDP in (6.4). Furthermore, we consider the distance between the trading partners with respect to three relative factor endowments in (6.5), which are labor force *L*, the capital stock *K*, and agricultural land area A_l.

$$y_{ijt} = \left(\frac{GDPpc_{it}^2}{\left(GDPpc_{it} + GDPpc_{jt}\right)^2} + \frac{GDPpc_{jt}^2}{\left(GDPpc_{it} + GDPpc_{jt}\right)^2} \right) - \frac{1}{2}, y_{ijt} \in (0, 0.5) \tag{6.3}$$

$$Y_{ijt} = \ln\left(GDP_{it} + GDP_{jt}\right) \tag{6.4}$$

$$f_{kijt} = ln\left(\frac{F_{kjt}}{GDP_{jt}}\right) - ln\left(\frac{F_{kit}}{GDP_{it}}\right), F_k \in \{L, K, A_l\} \tag{6.5}$$

ω_i, ω_j, and ω_t in equation (6.2) are respectively importer, exporter, and time fixed effects, which are employed using a Fixed Effect Estimator (FE) and time-dummies. Moreover, robust estimators clustering by country-pair-product are used to control for the shocks resulting in a heteroskedastic error term μ_{ijht}. ϕ_{ijht} is the inverse Mills ratio, obtained from the selection equation and μ_{ijht} denotes the error term.

In a final step, we consider all coefficients of NTMs (β_{2n}, β_{2in}) which are significant at least at a 5% level, to derive their corresponding AVEs. For this purpose, import demand elasticities were computed as reported in Ghodsi and Stehrer (forthcoming)[69]. AVEs are obtained by differentiating our import equation (6.2) with respect to each of our count variables for NTMs:

$$\frac{\partial \ln(m_{iht})}{\partial NTM_{njht}} = \frac{\partial \ln(m_{iht})}{\partial \ln(p_{iht})} \frac{\partial \ln(p_{iht})}{\partial NTM_{niht}} = \varepsilon_{ih} AVE_{ih}^n, \qquad \forall n \in \{ADP, SPS, TBT, QNTM\} \tag{6.6}$$

where p_{iht} are prices for product h imported to country i at time *t*, and ε_{ih} is the import demand elasticity of product h to country i, which is assumed to be constant during the period of analysis. Solving for AVEs and rearranging terms leaves us with four AVEs per product and importing country as follows:

$$AVE_{ih}^n = \frac{e^{(\beta_{2n} + \beta_{2ni})} - 1}{\varepsilon_{ih}}, \qquad \forall n \in \{ADP, SPS, TBT, QNTM\} \tag{6.7}$$

[69] Ghodsi and Stehrer (forthcoming) calculate the bilateral and unilateral import demand elasticities. Latter is the update of import demand elasticities from 2002 to 2011 using the approach by Kee et al. (2008). Former is an augmented approach with efficient estimators on country-pairs.

The heart of our dataset is the I-TIP notifications on NTMs compiled by the Economic Research and Analysis Department of the WTO, which later improved and documented by Ghodsi, Reiter and Stehrer (2015), who imputed a large number of HS codes for two thirds of the notifications with missing HS codes. Import data were taken from the COMTRADE database and were complemented by the TRAINS database. We consider AVEs of tariffs at the HS 6-digit level from TRAINS and the WTO Integrated Data Base (IDB) provided by World Integrated Trade Solutions (WITS). The data gathering on tariffs followed a three-step choice rule: Whenever available, preferential rates (PRF) were considered. When this information was not given or not applicable, the most-favored-nation tariff rates (MFN) entered our set. Lastly, when no information of PRF and MFN was given, we used data on the effectively applied tariff rates (AHS). Moreover, where AVEs of tariffs are not available, raw data on tariffs are used. It is important to mention that since there is no available data on tariffs between the EU member states, zero tariffs are included.

Data on factor endowments (labor force and capital stock) as well as GDP were retrieved from the Penn World Tables (PWT 8.1; see Feenstra et al., 2013, and 2015). The latest update of the PWT includes data for 2011, which constrains our analysis to the period 2002 to 2011. Output-side real GDP per capita at chained PPP in 2005 USD was used for the computation of the similarity index, while expenditure-side real GDP at chained PPP in 2005 USD was considered for representing the traditional market (demand) potential. Information on agricultural land was taken from the WDI of the World Bank. CEPII provides data on commonly used gravity variables as mentioned above. Finally, we borrow a data compilation for Preferential Trade Agreements (PTAs) as reported by the WTO.

6.4. Empirical Results

Our investigation results in 698,848 importer-product specific observations. Considering imports of products at the HS-6-digit level, each importer in our sample imports at least 30 products, in the case of Sierra Leone, and a maximum of 5,211 products, in the case of Canada. The average is 4,842 products per importer.

Each HS-6-digit product was imported by at least 40 countries, as in the case of lysergic acid (HS 293963) and beryllium waste (HS 811213), and at most by 149 countries for machinery, i.e. magnetic or optical readers and machines for transcribing data onto data media (HS 847190) and still image video cameras (HS 852540). On average, each product was imported by 136 countries.

86% of all AVEs calculated are attributable to the manufacturing sector, and 14% to the agriculture and food sector respectively. About 40% of our observations correspond to high-income countries. Table 6.1 summarizes the number of observations by two sectors and by the World Bank's income group classification.

We dealt with extreme values and potential outliers in two steps: First, we set the lowest non-zero AVEs equal to the 0.1 percentile and the highest non-zero AVEs equal to the 99.9 percentile of the distribution for each NTM type. Second, we define the lower bound for

negative AVEs at -100%. The rational for this is that a price for a product can only be reduced by a maximum of 100%. Therefore, we replaced all AVEs smaller than -1, or equally -100%, by this lower bound. Figure 6-3 in the Appendix depicts the resulting distribution of non-zero AVEs per NTM.

Table 6.1 – Distribution of AVEs by Income Group and Sector

	Agri. and Food		Manufacturing	
High income: OECD	22,082	*23.2%*	138,127	*22.9%*
High income: non OECD	14,937	*15.7%*	91,795	*15.2%*
Upper middle income	23,589	*24.8%*	148,468	*24.6%*
Lower middle income	21,168	*22.3%*	137,152	*22.7%*
Low income	13,306	*14.0%*	88,224	*14.6%*
	95,082		**603,766**	
AVEs per Sector	*13.61%*		*86.39%*	

Note: It is the data including intra-EU trade

Out of 698,848 importer-product-pairs, 97,533 – that is 13.96% - were significantly affected by at least one NTM, resulting in 113,816 non-zero AVEs. Eighty-four per cent of those affected did face only one type of NTM, 15% were confronted with two types and for less than one per cent we observed three types of NTMs. Excluding intra-EU trade results in an increasing number of non-zero AVEs by 6.4% although the number of total observations was reduced by roughly 0.8 per cent. This is possible, as zero AVEs are either due to non-existence of a specific NTM for a given importer-product pair, or because the NTM has a statistically insignificant impact on its trade flows. Thus, including intra-EU trade and therefore a higher number of similar NTMs, average AVEs of NTMs are more likely to turn insignificant. We therefore put more emphasis on the analysis of NTMs excluding intra-EU trade.

For the sample excluding intra-EU trade we find that 47.7% of all non-zero AVEs show a positive sign – i.e. a trade impeding effect. Our results therefore suggest, that the majority of NTMs is rather trade promoting than being a trade barrier. Table 6.2 lists the number of positive, zero, and negative AVEs per NTM type for the sample excluding intra-EU trade. It shows that the only NTMs exhibiting a greater share of trade impeding AVEs are technical barriers to trade. When putting import weights to the shares, it can be seen that non-zero AVEs gain in importance. It results in TBTs and SPS measures showing a higher share of trade restrictive AVEs. In addition, for other quantitative measures, the share of positive AVEs increases more strongly than the share of negative AVEs.

Considering non-zero AVEs only, 4.4% are observed for antidumping measures and 23% correspond to SPS measures. The majority of non-zero AVEs are found in case of TBTs with 70% and the remaining 2.6% of non-zero AVEs refer to other quantitative measures (Table 6.3).

Adding up the calculated AVEs for each NTM type gives the overall impact of NTMs on prices. Figure 6-1 gives some first insights on how it differs by income group of the importing country and by sector. First, the box plots indicate that for each income-sector combination we find positive and negative AVEs of often-similar magnitude, with the median being around zero.

Second, the range of AVEs is much larger for the manufacturing sector than for the agricultural and food sector. Third, high-income countries that are not OECD members are showing the highest impacts on trade, while these are smallest for low-income countries.

Table 6.2 – Sign of AVEs per NTM type, excl. intra-EU trade

		No. of AVEs	Shares	Import-weighted
ADP	< 0	4 088	0,6%	3,4%
	= 0	688 257	99,2%	95,6%
	> 0	1 201	0,2%	1,0%
SPS	< 0	14 040	2,0%	2,9%
	= 0	665 662	96,0%	93,8%
	> 0	13 844	2,0%	3,3%
TBT	< 0	37 876	5,5%	13,7%
	= 0	608 725	87,8%	70,6%
	> 0	46 945	6,8%	15,7%
OTHER	< 0	1 786	0,3%	2,3%
	= 0	690 392	99,5%	95,8%
	> 0	1 368	0,2%	1,8%

Source: own calculation

Table 6.3 – Number of non-zero AVEs

	Including intra-EU trade		Excluding intra-EU trade	
	non-zero AVEs	% of non-zero AVEs	non-zero AVEs	% of non-zero AVEs
ADP	5 682	4,99%	5 289	4,37%
SPS	26 293	23,10%	27 884	23,02%
TBT	78 742	69,18%	84 821	70,01%
QNTM	3 099	2,72%	3 154	2,60%
NTMs Total	113 816	100,00%	121 148	100,00%
Tariffs	508 773		508 241	

Source: own calculation

Figure 6-1 – Non-zero AVEs of NTMs by Sector and Income Group

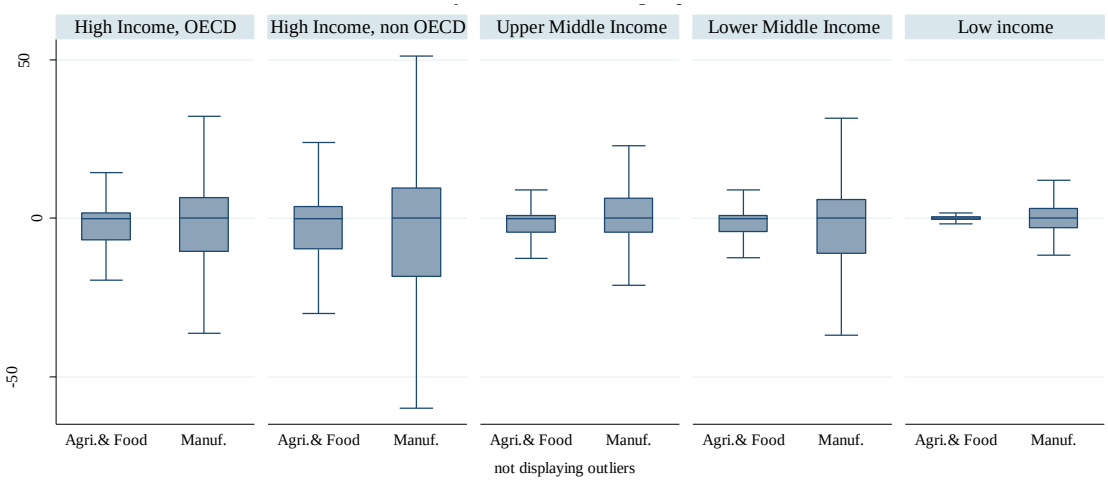


Figure 6-1 does not display outlier values. However, a non-negligible number of observations shows AVEs smaller at -100%. This is especially for antidumping measures, suggesting that we are possibly capturing the "dumping effect" of the exporter rather than the "antidumping response" by the importer.

The number of AVEs at the minimum of -100% is higher for every type of NTM for the sample including intra-EU trade. Believing in the harmonization of regulations at the European level, this is what we would expect. If an NTM is introduced by a member state of the European Union, it should be found in the I-TIP NTM database of the WTO. However, we cannot distinguish between NTMs that substantially differ among EU members and those that were adopted by all EU members in the same or a similar way. While we would expect a trade impeding effect from the former, we would likewise expect a trade promoting effect among EU members from the latter. Therefore, the greater number of trade-boosting effects when including intra-EU trade might point to the advantages of the harmonization of NTMs.

Comparing our AVE results for the sample including all countries with those obtained by excluding intra-EU trade shows that the former are on average smaller than the latter. Additionally, we find a smaller number of significant effects for AVEs, when including intra-EU trade, as shown in Table 6.3. Both observations support the view that NTMs within the EU are more harmonized and consequently, including intra-EU trade in our regression analysis while not being able to capture the level of harmonization between countries' NTMs bias our AVE results downwards. However, when intra-EU trade is excluded, we still find 55.7% of all non-zero AVES for antidumping measures to lie at the lower bound of -100%. The share of non-zero AVEs at -100% for SPS measures is 4.2%, for TBTs it is similar at 4.1% and for other quantitative restrictions it is 18.5%. Computing the sum over all NTM types, we find 6.7% of all significant AVEs to feature at the lower bound.

6.4.1. Average AVEs by Income Group

Table 6.4 displays the mean of non-zero AVEs per income group of the importing country, the NTM in question and over two sectors, excluding intra-EU trade and its 6.7% of AVE

observations at the lower bound.[70] Columns (1), (3) and (5) present the simple mean over non-zero AVEs in total and for the manufacturing and agri-food sectors respectively. Import-weighted[71] results are shown in columns (2), (4) and (6).

As mentioned above, we find high negative AVEs for ADP which could be explained either by quality adjustments of the exporter following an antidumping filing (which was found in the third chapter) or by the possibility that we capture the preceding dumping effect and not the antidumping effect. For SPS measures, we find trade impeding effects for three income groups for the manufacturing sector, but trade promoting effects in the agricultural sector. Overall, this results in a simple average AVE of -1.73%. Unlike SPS measures, TBTs exhibit an overall positive average AVE of 1.10% and are on average trade restricting in the manufacturing sector for every income group, but again trade enhancing in the agricultural sector. In fact, standards and regulations within these core qualitative NTMs can improve the market efficiencies by increasing information available in the market, in addition to affirming the imports against health, environmental and safety concerns in the market. Hence, observing a trade promoting TBT or SPS does not seem to be surprising. This issue has been also stated in the literature, which is why WTO agreements allow for the legitimate application of these policy instruments. However, there are also measures restricting trade, which could potentially raise trade disputes, especially within the WTO dispute settlement mechanism as discussed in the fourth chapter. For the last group of NTMs, which comprises safeguards, special safeguards, countervailing duties and quantitative restrictions, we find a trade promoting AVE of -2.88% on average. Yet, we find positive AVEs in the agricultural sector of high-income non-OECD countries, and trade impeding effects for lower middle-income countries for both sectors.

[70] Table 6.10 in the Appendix additionally shows the results, when lower observations at -100% are included in the calculation of AVE means.

[71] $Weighted\ mean\ AVE_{Gn} = \frac{Simple\ mean\ AVE_{Gn} * Average\ Imports_{Gn}}{Average\ Imports_{G}}, \forall\ Income\ Group\ G\ and\ NTM\ n$

Table 6.4 – Mean AVEs by NTM, Income Group and Sector; for AVEs > -100, excluding intra-EU trade

		Total		*Manufacturing*		*Agriculture*	
		(1) Mean	(2) Imp. weighted	(3) Mean	(4) Imp. weighted	(5) Mean	(6) Imp. weighted
High Income: OECD	ADP	-25,12	-72,83	-25,84	-95,11	-24,00	-54,43
High Income: non OECD	ADP	-25,62	-51,83	-28,45	-68,16	-18,42	-21,67
Upper Middle Income	ADP	-19,52	-76,40	-21,85	-100,00	-16,18	-79,38
Lower Middle Income	ADP	-23,49	-100,00	-24,48	-100,00	-5,75	-42,84
High Income: OECD	SPS	-2,08	-1,62	-1,45	-1,30	-2,49	-2,84
High Income: non OECD	SPS	0,01	0,01	2,96	1,25	-0,58	-0,61
Upper Middle Income	SPS	-1,29	-1,96	0,75	2,21	-1,93	-4,27
Lower Middle Income	SPS	-2,08	-2,65	-2,00	-3,63	-2,11	-3,29
Low Income	SPS	-0,45	-0,75	3,83	5,65	-0,72	-1,04
High Income: OECD	TBT	0,94	1,21	1,40	1,95	-0,45	-0,50
High Income: non OECD	TBT	1,29	0,70	2,90	1,76	-1,42	-0,96
Upper Middle Income	TBT	1,86	4,82	2,94	8,60	-1,18	-2,38
Lower Middle Income	TBT	0,22	0,36	1,31	2,54	-1,59	-2,06
Low Income	TBT	0,07	0,20	0,25	0,98	-0,43	-0,46
High Income: OECD	QNTM	-1,22	-5,69	-1,15	-5,50	-1,70	-4,92
High Income: non OECD	QNTM	-2,85	-25,26	-3,08	-26,03	4,11	14,59
Upper Middle Income	QNTM	-12,32	-18,17	-12,06	-14,14	-19,92	-100,00
Lower Middle Income	QNTM	19,10	561,59	22,71	761,55	1,06	0,34

Source: own calculation

Although we find evidence for trade promoting effects of NTMs, it has to be kept in mind, that our computed AVEs are importer-product specific and not bilateral-product specific. Therefore, a negative AVE could imply, that the imposed NTM was trade promoting for the all exporting countries. However, it could also imply that the imposition of NTMs leads to some trade diversions, outweighing the trade reductions of the affected exporter. Considering an exporter whose domestic standards and regulations are closer to those of the NTM imposing country, the NTM should have trade promoting effects for this specific exporter, while for other exporters, it might reduce the trade flows to the imposing country.

6.4.2. Average AVEs by Product Group

As different NTM types target different product categories, we show the maximum and minimum non-zero AVEs calculated by product at the HS-2-digit level in Table 6.5[72]; again excluding observations below the lower bound of -100%.

[72] Table 6.11 and Table 6.12 in the Appendix report the results for mean and median non-zero AVEs for all 96 HS 2-digit categories.

Table 6.5 – AVEs of NTMs by product (HS-2-digit)

			ADP	SPS	TBT	QNTM
Incl. EU	Highest AVEs	simple average	HS 31; 97.041	HS 97; 48.406	HS 89; 61.983	HS 31; 69.583
		median	HS 31; 97.041	HS 97; 48.406	HS 89; 68.356	HS 31; 69.583
	Lowest AVEs	simple average	HS 74; -71.341	HS 69; -70.940	HS 5; -18.489	HS 88; -54.771
		median	HS 74; -71.341	HS 69; -80.404	HS 67; -7.602	HS 88; -68.916
Excl. EU	Highest AVEs	simple average	HS 31; 81.929	HS 89; 48.278	HS 97; 70.994	HS 97; 65.480
		median	HS 31; 81.186	HS 89; 45.490	HS 89; 79.773	HS 97; 64.648
	Lowest AVEs	simple average	HS 83; -61.503	HS 94; -53.477	HS 35; -15.774	HS 6; -80.215
		median	HS 83; -70.070	HS 94; -69.737	HS 93; -25.340	HS 6; -80.215

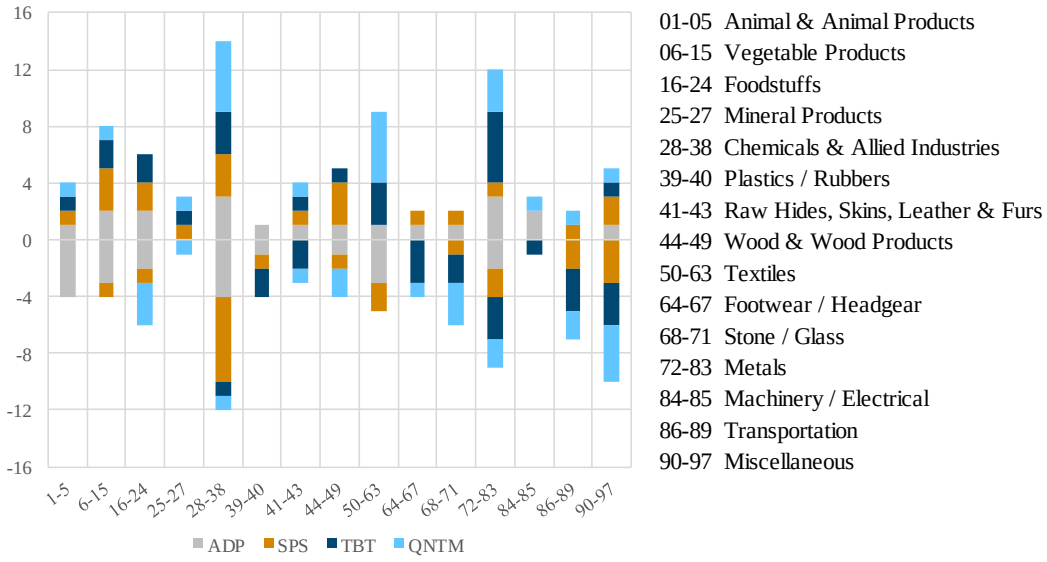
Source: own calculation

Focusing on the sample excluding intra-EU trade (bottom half of Table 6.5) we find the lowest AVEs for antidumping measures for miscellaneous articles of base metal (HS 83). The highest average AVE of antidumping is reported for fertilisers (HS 31). Furniture, bedding and lamps (HS 94) face the lowest average and median AVEs of SPS measures, while ships, boats and floating structures (HS 89) show the highest AVEs. The lowest average and median AVEs of TBTs are reported for albuminoidal substances, modified starches, glues, and enzymes (HS 35) as well as for arms and ammunition (HS 93), respectively. Trade in works of art, collectors' pieces, and antiques (HS 97) in terms of the mean and trade in ships and boats (HS 89) in terms of the median seems to be restricted by TBTs. The group of other quantitative measures seems to have the greatest trade promoting effects on live trees and other plants (HS 6), while they appear as trade restrictive for works of art (HS 97). Including intra-EU trade (top half of Table 6.5) does not change the group of products facing the highest AVEs, but the focus shifts form works of arts to fertilisers, which show the highest mean and median AVEs for ADP and QNTM.

Overall, NTMs seem to feature as restricting tools for trade in chemicals, metals, textiles and vegetable products, mainly due to quantitative restrictions and TBTs. However, the chemicals and metals sector are also among the HS-2-digit product groups showing the lowest mean AVEs, i.e. the highest trade promoting effects. These trade-promoting effects could be driven by scarcity of resources of the importing country. An example could be the European Union, whose dependency on imported metals has fast grown in recent decades. Its imports exceeded its exports by about a third in 2012, and 40% of the latter are attributable to Germany, the UK and Italy alone.[73] If a country or region is dependent on imports of a product, the imposition of an NTM can only have an impact on (1) the exporter choice, (2) possibly the exporter product quality and (3) it increases the price of the imported product and thereby – keeping units constant – increases import values. Figure 6-2 summarizes these findings by counting the top 20 HS-2-digit products (highest AVEs, positive values) and bottom 20 HS-2-digit products (lowest AVEs, negative values) per HS6 group and NTM type.

[73] http://ec.europa.eu/enterprise/sectors/metals-minerals/non-ferrous-metals/competitiveness/index_en.htm

Figure 6-2 – Number of HS-2-digit products per product group and NTM type excl. intra-EU trade



6.4.3. Average AVEs by Importer

Table 6.6 – Top 20 Mean AVEs by Importer (with corresponding median AVEs)

	ADP			SPS			TBT			QNTM		
Rank	Imp.	Mean	Median	Imp.	Mean	Median	Imp.	Mean	Median	Imp.	Mean	Median
1	JOR	73.64	73.64	HRV	17.60	8.80	ROM	22.13	20.46	TUR	62.14	62.14
2	ROM	36.35	58.10	ROM	14.40	19.02	IDN	19.80	11.94	MAR	55.61	55.61
3	KOR	17.73	11.70	MKD	11.97	2.58	BLZ	18.95	11.11	PAK	45.59	44.56
4	BEL	13.27	31.63	MNG	11.34	2.52	CAF	16.88	0.70	LVA	41.82	50.13
5	IDN	10.83	13.70	BEN	10.69	2.37	JOR	11.31	3.27	BRA	31.26	2.56
6	THA	10.15	3.86	MLT	8.60	2.74	MAR	8.62	2.72	EST	26.28	14.28
7	AUT	6.94	12.68	KEN	7.04	-0.07	SGP	7.53	4.86	MLT	22.16	25.58
8	JPN	5.68	5.68	TTO	7.00	7.00	MLT	7.27	2.98	LTU	22.07	16.80
9	CYP	5.37	11.13	BRN	6.51	6.46	LTU	7.12	1.96	CYP	20.05	20.45
10	EST	5.18	1.54	LTU	5.20	0.70	MNG	7.01	-1.40	ROM	18.56	35.83
11	NLD	2.04	5.70	SGP	4.19	0.59	HRV	6.35	0.72	IRL	16.60	16.83
12	LVA	1.65	10.34	BLZ	4.15	0.72	HUN	5.84	2.90	SVK	15.86	3.87
13	CZE	1.51	7.77	FJI	3.88	0.77	AUS	4.85	1.02	SVN	13.59	7.78
14	RUS	1.43	3.08	IDN	2.85	-0.02	NZL	4.74	0.65	LUX	12.36	11.22
15	DEU	1.06	4.02	JOR	2.81	1.51	ISR	3.98	0.95	AUT	10.82	9.82
16	ISR	0.87	-6.38	HUN	2.13	0.64	CYP	3.64	0.43	USA	10.47	12.41
17	SVN	-0.58	7.64	BOL	1.99	0.94	USA	3.59	0.30	ISR	9.32	9.32
18	GRC	-1.01	1.70	LVA	1.35	0.42	CZE	2.83	0.53	BEL	8.12	3.92
19	BGR	-2.44	2.05	KWT	1.28	3.70	GHA	2.65	0.13	IND	8.02	1.91
20	EGY	-2.59	-2.59	MDG	1.25	0.08	SVN	2.57	0.71	POL	7.40	2.95

Source: own calculation

Popularity, effectiveness and the direction of the price effects of NTMs therefore also differ greatly among NTM imposing importers. Excluding intra-EU trade and AVEs at the lower bound, Table 6.6 lists the top 20 countries with the highest mean non-zero AVE per NTM type, and their corresponding median AVEs. We find 54 countries with non-zero AVEs on

antidumping, 91 countries showing non-zero AVEs for SPS measures, 96 countries exhibiting non-zero AVEs for TBTs and 52 countries for which AVEs on other quantitative measures are non-zero. Thereof, 29.6%, 37.4%, 64.6% and 63.5%, respectively, show positive mean AVEs.

Looking at magnitudes of mean AVEs by importer country, AVEs for SPS and TBT are found in a similar range, while positive AVEs for QNTM and ADP are about three to four times larger. Mean AVEs for ADP range from 74% for Jordan to -80% for Malaysia. The highest mean AVE for SPS measures is only as large as a fourth of the maximum mean AVE for ADP and is found for Croatia with 18%. The lowest mean AVE for SPS measures is reported for Mauritius with -17%. For TBTs, mean AVEs range from 22% for Romania to -10% for Barbados. Finally, the highest mean AVE for QNTM is 62% for Turkey, while the lowest mean AVE of -22% is attributable to Peru.

Interestingly, seven EU member countries are among the top 40 of highest mean AVEs for all four NTM types. These are the two countries that acceded to the EU in 2007, namely Bulgaria and Romania, the three Baltic states, i.e. Estonia, Latvia and Lithuania, and two countries that entered the EU in 2004, namely Hungary and Malta. One might want to highlight Romania, which is ranked second for ADP, second for SPS measures, and even first for TBTs. Including intra-EU trade decreases the prominence of EU member countries. Considering countries outside the EU, the geographical spread of the countries does not allow to draw conclusions on regional patterns.

6.4.4. Average AVEs by BEC

In order to assess the impact of AVEs along the production and supply chains, we further break down our results into the broad economic categories (BEC). We make use of a correspondence table from HS to BEC for WIOD[74] that puts weights on HS-6-digit products given their use (1) as intermediate goods (INT), (2) for final consumption (FC), or (3) for gross fixed capital formation (GFCF). Take the example from our sample of HS code 940540 comprising electric lamps and lighting fittings. Our correspondence table suggests a 50% use as intermediate product, a 25% use for final consumption, and a 25% contribution to gross capital formation. Table 6.7 reports our estimated AVEs per NTM type, split up by sector and the broad economic categories.

Excluding intra-EU trade and AVEs smaller than -100%, we find the greatest trade impeding effects in the agricultural sector, for final consumption goods that are targeted by antidumping measures or other quantitative restrictions. SPS measures and TBTs by contrast, show negative AVEs. The picture seems to be reversed for the manufacturing sector. There, TBTs show the highest trade restricting effects for intermediate goods, followed by consumption goods and gross capital formation. Interestingly, SPS measures show on average trade promoting effects for intermediates, but trade restricting effects for final consumption goods and gross capital formation. The greatest trade promoting effect is observable for antidumping measures in the manufacturing sector, followed by SPS measures for final consumption goods of the agri-food

[74] See www.wiod.org

sector. Including intra-EU trade increases the trade restricting effect of other quantitative measures on imports of agri-food products. However, the trade impeding effects of those measures on intermediate manufactured goods, as well as the trade reducing impact of SPS on manufactured consumption goods and of ADP on agricultural consumption goods disappears.

Table 6.7 – Average AVEs by BEC/WIOD classification; excluding intra-EU trade and AVEs <-100%

		Manufacturing					*Agriculture*					
	NTM	***Total***	***INT****	***FC****	***GFCF****	***n***	***Total***	***INT****	***FC****	***GFCF****	***n***	***NTM***
	ADP	-10.22%	-4.98%	-4.31%	-0.94%	*1537*	7.20%	-0.74%	7.93%	0.00%	*804*	ADP
	SPS	-0.21%	-0.52%	0.18%	0.12%	*8414*	-1.22%	-0.33%	-0.88%	-0.02%	*18307*	SPS
	TBT	1.98%	0.87%	0.56%	0.55%	*58595*	-0.68%	-0.26%	-0.41%	-0.02%	*22735*	TBT
	QNTM	-0.62%	0.11%	-0.12%	-0.60%	*2351*	3.15%	0.07%	3.08%	0.00%	*220*	QNTM
Import-weighted	ADP	-81.52%	-45.80%	-43.83%	-2.19%		39.07%	-1.30%	57.68%	0.00%		ADP
	SPS	-0.46%	-1.34%	0.53%	0.03%		-2.55%	-0.68%	-1.84%	-0.02%		SPS
	TBT	5.47%	2.56%	1.68%	1.10%		-1.26%	-0.49%	-0.74%	-0.01%		TBT
	QNTM	-5.56%	0.92%	-1.58%	-3.89%		25.18%	0.30%	30.45%	0.00%		QNTM

** INT = intermediates; FC = Final Consumption; GFCF = Gross Fixed Capital Formation*

6.4.5. Relating AVEs of NTMs to Tariffs

A frequently asked question concerning NTMs is whether they feature as policy instruments to substitute for tariff cuts. Table 6.8 summarizes the results of a first simple regression, where ad-valorem tariffs are related to our estimated AVEs for NTMs. Columns (1) and (4) show results, when product fixed effects (FE) are employed, i.e. they account for the fact that some products are facing higher levels of protection. Coefficients therefore capture the variation between countries. It can also be the case that countries exhibit lower/higher tariffs and apply NTMs less/more frequently due to specific trade agreements. We therefore also control for importer FE in columns (2) and (5), showing the variation between products. Columns (3) and (6) incorporate product and importer FE and therefore capture the essence of the question: the within country and product variation. Columns (4) to (6) are regressions on import weighted AVEs.

Five out of six specifications point towards a tariff substitution effect for antidumping. For other quantitative measures, four specifications indicate a tariff substitution effect. Coefficients for SPS measures are negative (substitutes) and those for TBTs are positive (complements). However, none of the within country and product coefficients turn out to be significant.

We continue elaborating the relationship between tariffs and NTMs along the BEC classification. For this purpose, we regress for each BEC category the import-weighted ad-valorem tariffs on our estimated import weighted AVEs. We further include product and importer country dummies to capture the within industry and country variation. The results are summarized in Table 6.9. We run five OLS regressions per BEC category. In the first four regressions we considered only one NTM type as explaining variable, with the condition that we only consider non-zero AVEs. For example, column (1) shows the results when we regress import-weighted ad-valorem tariffs for intermediates on our non-zero AVE estimations for antidumping. The fifth regression incorporates all four NTM types simultaneously, with the

condition that we consider only country-product pairs for which at least one non-zero AVE of any NTM type was estimated.

Table 6.8 – Relation between tariffs and NTMs

				Import weighted		
Dep. Variable Tariffs	(1)	(2)	(3)	(4)	(5)	(6)
AVE(ADP)	-0.0098	-0.0049	-0.0002	-0.0222	-0.0279	-0.0207
	[0.0017] ***	[0.0014] ***	[0.0016]	[0.0036] ***	[0.0042] ***	[0.0035] ***
AVE(SPS)	0.0033	-0.0107	-0.0004	-0.0232	-0.0241	-0.0227
	[0.0030]	[0.0029] ***	[0.0028]	[0.0251]	[0.0249]	[0.0249]
AVE(TBT)	0.0020	0.0031	0.0005	0.0007	0.0005	0.0008
	[0.0010] **	[0.0009] ***	[0.0009]	[0.0008]	[0.0008]	[0.0008]
AVE(QNTM)	-0.0054	0.0075	-0.0032	-0.0262	-0.0350	-0.0257
	[0.0025] **	[0.0025] ***	[0.0024]	[0.0068] ***	[0.0116] ***	[0.0068] ***
Constant	5.1488	5.1544	1.3841	1.5e+06	1.5e+06	-6.9e+05
	[0.0285] ***	[0.0302] ***	[0.2381] ***	[5.5e+04] ***	[5.3e+04] ***	[2.4e+05] ***
N	103739	103739	103739	103739	103739	103739
adj. R^2	0.221	0.099	0.333	0.170	0.064	0.184
Importer FE	*No*	*Yes*	*Yes*	*No*	*Yes*	*Yes*
Product FE	*Yes*	*No*	*Yes*	*Yes*	*No*	*Yes*

Standard errors in brackets; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Our results strongly suggest a substitution effect between tariffs and antidumping measures for all BEC categories, with the lowest magnitude for intermediate products. They also show a substitution effect for other quantitative measures for intermediate products and a less significant substitution effect for SPS measures for gross fixed capital formation. Only TBTs appear as significantly complementary instruments to tariffs for final consumption goods.

Table 6.9 – Complementary and Substitution Effects between Tariffs and NTMs by BEC classification, import weighted, excluding intra-EU trade

Dep. Variable AVE_{BEC}*(Tariffs)*	*Intermediates*					*Final Consumption*					*Gross Fixed Capital Formation*				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
AVE_{BEC}(ADP)	-0.0099				**-0.0173**	**-0.0316**				**-0.0326**	**-0.0489**				**-0.0490**
	[0.0070]				**[0.0029]*****	**[0.0085]*****				**[0.0087]*****	**[0.0043]*****				**[0.0039]*****
AVE_{BEC} (SPS)		-0.0129			-0.0112		-0.0621			-0.0499		**-0.0129**			-0.0172
		[0.0236]			[0.0264]		[0.0737]			[0.0600]		**[0.0067]***			[0.0319]
AVE_{BEC} (TBT)			0.0007		0.0003			**0.0310**		**0.0299**			-0.0099		-0.0099
			[0.0006]		[0.0005]			**[0.0151]****		**[0.0157]***			[0.0071]		[0.0072]
AVE_{BEC} (QNTM)				**-0.0159**	**-0.0215**				-0.0305	-0.0216				-0.0879	-0.0776
				[0.0038]***	**[0.0035]*****				[0.0268]	[0.0203]				[0.0632]	[0.0507]
Constant	-3.1e+05	-2.8e+06	-7.8e+05	2.8e+06	-1.2e+05	-3.9e+06	-6.5e+05	-6.0e+05	3.9e+06	-6.3e+05	1.2e+06	1.6e+05	3.7e+05	2.2e+08	5.3e+04
	[1.9e+06]	[1.4e+06]*	[4.7e+05]*	[2.4e+06]	[1.3e+05]	[3.4e+06]	[5.7e+05]	[3.6e+05]*	[7.3e+06]	[2.0e+05]**	[9.5e+05]	[1.4e+05]	[1.9e+05]*	[1.4e+08]	[2.2e+04]*
N	2938	13491	49574	2026	103739	2479	15599	34472	978	103739	335	390	11450	665	103739
adj. R^2	0.404	0.057	0.068	0.346	0.109	0.458	0.099	0.085	0.217	0.134	0.867	0.568	0.209	0.439	0.513
Importer FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Product FE	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Condition	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	*At least one NTM*	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	*At least one NTM*	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	$AVE_{BEC} \neq 0$	*At least one NTM*

Standard errors in brackets; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

$AVE_{BEC'}$ are import weighted AVEs per product and importer differentiated according to the BEC classification (intermediate good, final consumption, gross fixed capital formation).

$$AVE_{BEC,n} = Imports_{ih} * BEC_h * AVE_{ihn}$$

Breaking the results down to the sector level, we find that most of the effects are attributable to the manufacturing sector. In addition to what is presented in Table 8, the regression analysis for the manufacturing sector fosters the perception that SPS measures serve as substitutes for tariffs, not only for GFCF but also for final consumption goods. Considering the agri-food sector, we are left with five significant coefficients indicating a very strong substitution effect for antidumping for intermediate products. It further underlines a substitution effect for other quantitative measures for intermediates, observable for the manufacturing and agricultural sector, but also points to a complementary effect of other quantitative measures for final consumption products. Thus, the only group of products for which tariffs and AVEs of NTMs significantly go into the same direction are final consumption goods. Indeed, this is in line with the political debate on the two faces of NTMs: NTMs as possible means for consumers protection on the one hand and as industry protecting tools on the other.

6.5. Conclusion

In this chapter, we calculate the ad-valorem equivalents (AVE) of non-tariff measures (NTMs) at the 6-digit product level of the Harmonized System for 149 importing countries over the period 2002-2011. We make use of the I-TIP database on NTM notifications of the WTO. Four different types of NTMs are considered in the analysis: antidumping (ADP), technical barriers to trade (TBT), sanitary and phytosanitary measures (SPS) and other quantitative measures (QNTMs). For this purpose, we further developed the methodology proposed by Kee et al. (2009). In addition, acknowledging the potential of NTMs to reduce information asymmetries, trade effects of NTMs are not restricted to be solely negative. When excluding intra-EU trade, our procedure results in 121,148 significant non-zero importer-product specific AVEs, of which less than 50% show a trade impeding effect. 69% of all computed non-zero AVEs correspond to TBTs, which is the only NTM type for which the number of positive – i.e. trade restricting – AVEs exceeds the number of negative AVEs. The highest trade restricting effects are found for chemicals, metals, textiles and vegetable products, due to TBT and QNTM measures. Distinguishing the effects of NTMs by the broad economic categories (BEC) classification, we find the overall highest trade impeding effects in the agricultural sector for final consumption goods affected by antidumping and other quantitative measures. TBTs and SPS measures seem to hamper trade in the manufacturing sector, but rather foster trade in the agri-food sector. Finally, TBTs are the only NTM type that is found to complement tariffs for final consumption goods, while SPS measures serve as substitutes to tariffs for gross fixed capital formation, other quantitative measures work as substitutes for intermediate products and ADP features prominently as substitute to tariffs for every BEC category.

Although we find evidence for trade promoting effects of NTMs, it has to be kept in mind, that our computed AVEs are importer-product specific and not bilateral-product specific. On the one hand, a negative AVE could imply, that the imposed NTM was trade promoting for the all exporting countries. On the other hand, it could also imply that the imposition of NTMs leads to some trade diversions, outweighing the trade reductions of the affected exporter. Considering an exporter whose domestic standards and regulations are closer to those of the NTM imposing

country, the NTM should have trade promoting effects for this specific exporter, while for other exporters, it might reduce the trade flows to the imposing country. This argument will be tested calculating bilateral AVEs, which will be analyzed as an extension to this paper in future research.

6.6. Appendix

Distribution of non-zero AVEs of NTMs

Figure 6-3 – Including all AVEs, with AVEs smaller than -100% replaced by this lower bound

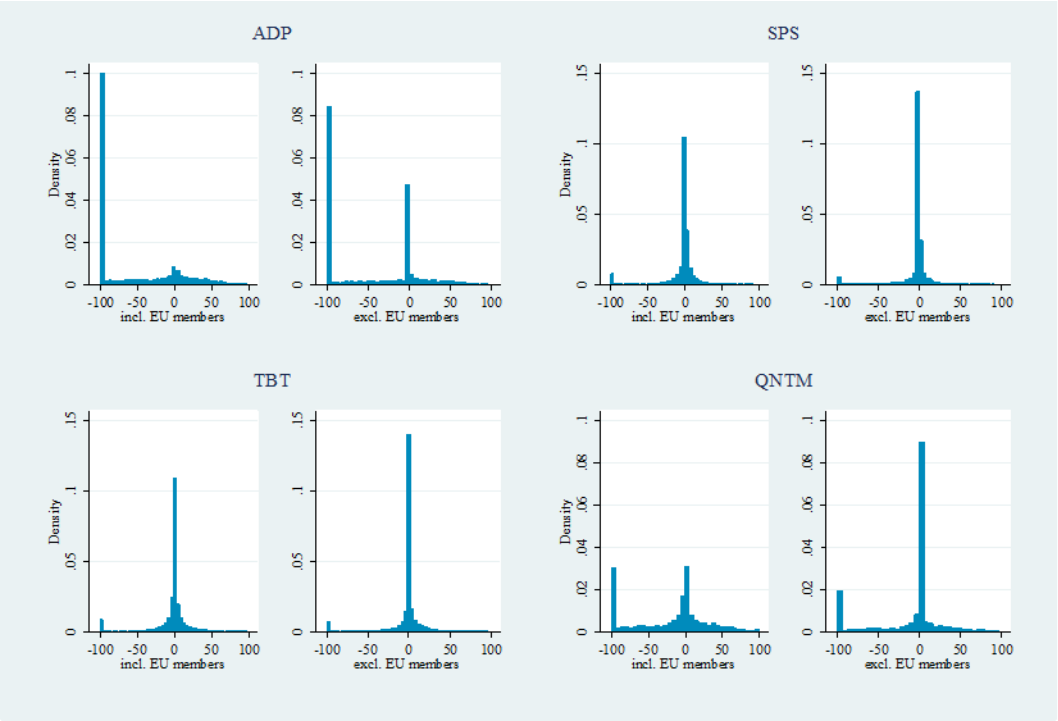


Figure 6-4 – Excluding AVEs smaller than -100%

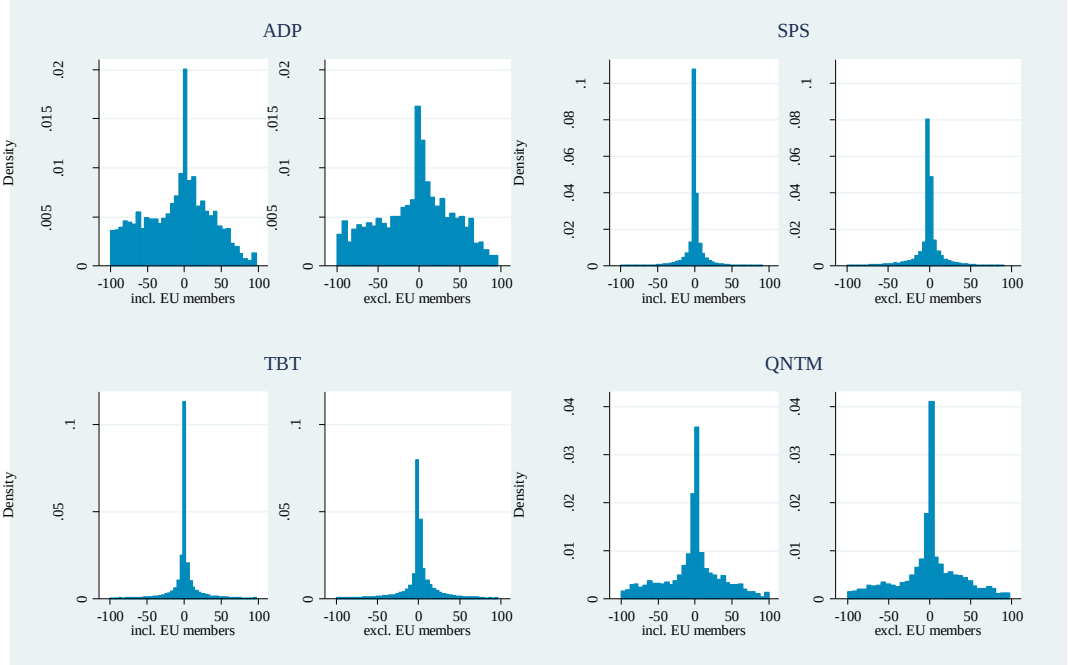


Table 6.10 – Mean AVEs by NTM, Income Group and Sector; excluding intra-EU trade, including -100% AVEs
(Extension to Table 6.5)

		Total		*Manufacturing*		*Agriculture*	
		(1)	(2)	(3)	(4)	(5)	(6)
		Mean	Imp. weighted	Mean	Imp. weighted	Mean	Imp. weighted
High Income: OECD	ADP	-59.33	-100.00	-62.71	-100.00	-52.80	-100.00
High Income: non OECD		-62.46	-98.25	-65.45	-100.00	-53.49	-48.17
Upper Middle Income		-47.40	-100.00	-55.29	-100.00	-31.05	-100.00
Lower Middle Income		-52.27	-100.00	-53.21	-100.00	-32.68	-100.00
High Income: OECD	SPS	-4.64	-3.59	-4.99	-4.37	-4.42	-4.98
High Income: non OECD		-6.14	-3.46	-3.17	-1.28	-6.74	-7.54
Upper Middle Income		-4.69	-7.25	-3.66	-11.16	-5.01	-10.92
Lower Middle Income		-6.55	-8.51	-10.13	-17.74	-5.19	-8.33
Low Income		-3.11	-5.80	3.83	5.65	-3.54	-5.72
High Income: OECD	TBT	-2.82	-3.58	-3.06	-4.22	-2.08	-2.27
High Income: non OECD		-3.72	-2.23	-2.50	-1.61	-5.79	-4.79
Upper Middle Income		-2.01	-5.15	-1.54	-4.43	-3.39	-6.86
Lower Middle Income		-4.81	-7.97	-5.09	-10.06	-4.32	-5.92
Low Income		-2.35	-7.18	-2.68	-10.21	-1.44	-1.56
High Income: OECD	QNTM	-10.85	-49.67	-10.92	-50.76	-10.32	-34.10
High Income: non OECD		-30.20	-100.00	-30.39	-100.00	-24.28	-83.19
Upper Middle Income		-24.23	-33.90	-24.36	-27.57	-19.92	-100.00
Lower Middle Income		-15.93	-100.00	-12.35	-100.00	-32.63	-80.92

Source: own calculation

Table 6.11 – Non-zero median AVEs by product (HS-2-digit level) sorted by HS 2002 sections
Excluding intra-EU trade and AVEs smaller than -100%

	HS2	*ADP*	*SPS*	*TBT*	*QNTM*	*HS2*	*ADP*	*SPS*	*TBT*	*QNTM*	
	1	x	-0.057	-0.202	-0.032	49	x	x	0.373	22.340	X.
	2	-13.614	0.021	-0.007	-4.416	50	x	0.331	0.600		
I.	3	10.224	-0.003	0.005	0.005	51	x	-0.015	-0.011	-0.425	
	4	-0.762	0.000	0.006	0.663	52	-3.365	0.018	0.009		
	5	x	0.143	-0.079	-1.132	53	x	0.005	-1.555		
	6	x	-0.574	0.447	-80.215	54	-20.349	x	0.152	-0.303	
	7	3.999	0.000	0.002	0.279	55	77.494	x	0.101	-0.531	
	8	24.090	-0.067	0.038		56	x	x	2.571	-48.547	XI.
	9	1.039	-0.025	0.020		57	x	x	0.933	10.812	
II.	10	-11.464	0.001	0.000	2.011	58	3.935	x	0.330	1.692	
	11	-1.943	0.004	-0.004	0.037	59	x	x	0.789	8.632	
	12	15.491	0.011	0.007	25.677	60	x	x	0.007		
	13	x	1.059	-0.166		61	x	x	0.273	0.262	
	14	x	-0.050	0.615		62	x	x	0.717	-5.325	
III.	15	-4.233	-0.002	0.005	0.215	63	12.882	11.143	1.485	2.006	
	16	-3.793	0.009	0.052	40.893	64	-37.784	x	0.020	0.115	
	17	-0.589	-0.008	0.051	8.109	65	x	x	4.211	21.074	XII.
	18	33.468	0.071	0.000	5.350	66	x	x	23.174	14.367	
	19	-0.424	-0.010	0.002	1.489	67	x	1.747	1.894		
IV.	20	22.503	0.006	0.061	31.515	68	4.003	0.088	0.826	21.971	
	21	-0.524	0.017	-0.010	8.607	69	3.050	0.089	0.868	5.485	XIII.
	22	-1.346	0.021	0.006	23.278	70	-19.217	2.866	1.217	9.363	
	23	-8.949	0.001	0.001	1.858	71	x	x	67.797	31.780	XIV.
	24	x	0.383	0.228		72	7.326	0.130	0.015	-0.017	
	25	x	-0.002	0.016	-3.377	73	-41.142	-0.303	1.015	7.360	
V.	26	x	0.001	0.010	0.172	74	x	x	1.006	1.330	
	27	2.912	0.000	-0.016	17.578	75	x	x	0.052	0.322	
	28	-5.330	0.011	0.133	-0.068	76	15.989	-0.125	-0.003	13.466	
	29	13.485	0.082	0.242	-1.241	78	x	x	-2.691	58.899	XV.
	30	x	0.250	0.006	-7.086	79	x	0.996	-3.168	14.138	
	31	81.186	18.670	52.253	61.568	80	x	8.254	-3.267		
	32	-50.386	0.212	-0.710	-22.293	81	19.118	x	0.049	-2.012	
VI.	33	-2.053	0.068	0.057		82	-32.300	1.571	3.469	22.782	
	34	19.527	0.645	0.574	1.683	83	-70.070	x	1.984	13.680	
	35	44.864	-0.023	0.070	-0.162	84	-14.073	0.299	1.367	-0.114	XVI.
	36	x	0.000	0.204	1.183	85	-29.326	-0.007	0.240	-5.948	
	37	-59.108	2.571	x	0.078	86	x	x	0.178	15.011	
	38	5.596	0.196	-0.004	0.062	87	24.182	4.570	16.374	-21.373	XVII.
VII.	39	25.547	8.547	35.410	19.513	88	x	-5.869	24.093	47.608	
	40	-59.133	0.182	4.407	0.652	89	x	45.490	79.773	36.825	
	41	-3.443	0.019	1.218	0.513	90	8.087	2.725	0.640	-33.001	
VIII.	42	x	-0.095	1.844	20.898	91	x	x	0.232	1.244	XVIII.
	43	x	0.368	4.290	2.780	92	x	x	1.141	8.196	
	44	-44.034	0.003	0.936	17.866	93	x	-24.689	-25.340	1.653	XIX.
IX.	45	x	0.118	x		94	x	-69.737	3.796	13.912	
	46	x	-0.988	x		95	x	4.736	4.776	43.973	XX.
X.	47	x	-0.204	x	0.174	96	-37.318	x	3.964	27.141	
	48	40.215	-0.001	-0.014	34.478	97	x	12.668	67.077	64.648	XXI.

Source: own calculation

Table 6.12 – Non-zero mean AVEs by product (HS-2-digit level) sorted by HS 2002 sections
Excluding intra-EU trade and AVEs smaller than -100%

	HS2	*ADP*	*SPS*	*TBT*	*QNTM*	*HS2*	*ADP*	*SPS*	*TBT*	*QNTM*	
	1	x	-1.495	-6.102	-3.037	49	x	x	3.350	15.016	X.
	2	-13.614	0.478	-2.315	-13.610	50	x	0.331	-0.134		
I.	3	5.766	-0.836	-0.463	5.651	51	x	-0.443	-3.159	-7.605	
	4	1.774	-2.006	-0.261	4.821	52	-9.159	1.735	-1.475		
	5	x	-2.272	2.161	-1.132	53	x	0.021	-8.637		
	6	x	-7.127	-3.250	-80.215	54	-21.903	x	-3.466	-6.960	
	7	6.799	-1.831	0.043	1.132	55	32.675	x	-1.983	12.415	
	8	18.833	-3.604	-0.402		56	x	x	0.730	-48.547	XI.
	9	-5.473	-1.594	-0.352		57	x	x	-0.500	-3.561	
II.	10	-33.337	-1.356	-0.580	3.194	58	3.355	x	-0.319	9.767	
	11	-12.921	-0.191	0.188	-5.332	59	x	x	-1.253	8.632	
	12	9.818	1.239	0.006	-3.576	60	x	x	-2.000		
	13	x	1.939	-5.009		61	x	x	0.888	-7.463	
	14	x	-3.708	-0.955		62	x	x	0.720	-11.614	
III.	15	-10.986	-1.032	-0.066	0.809	63	12.882	11.143	1.810	6.745	
	16	-11.183	-0.637	-0.072	24.176	64	-45.294	x	-1.866	-3.827	
	17	-17.473	-2.580	0.700	10.474	65	x	x	8.888	3.914	XII.
	18	38.324	-2.162	1.688	5.350	66	x	x	6.201	17.768	
	19	-9.930	-0.403	-1.580	6.820	67	x	-8.697	5.363		
IV.	20	17.287	-0.305	-1.038	27.700	68	-5.086	-0.469	0.602	22.928	
	21	-6.164	-3.990	-3.763	16.257	69	-7.304	-3.557	1.910	10.114	XIII.
	22	-0.027	1.910	-0.199	28.393	70	-18.917	4.257	3.887	18.894	
	23	-9.233	-1.864	-3.251	0.810	71	x	x	46.488	31.780	XIV.
	24	x	-1.376	3.503		72	9.104	-2.533	-2.695	-5.631	
	25	x	-3.168	-0.266	-24.143	73	-32.204	-0.303	2.623	0.874	
V.	26	x	-0.672	0.424	2.015	74	x	x	4.814	-5.872	
	27	-2.029	-1.040	-4.787	21.861	75	x	x	-0.181	-6.953	
	28	-10.077	-1.906	0.054	-3.926	76	-5.100	-0.409	-3.716	21.733	
	29	6.251	-1.459	-0.508	-5.975	78	x	x	-11.162	32.098	XV.
	30	x	2.731	-1.050	-13.545	79	x	0.996	-11.946	14.138	
	31	81.929	24.615	39.041	39.513	80	x	8.254	6.891		
	32	-50.386	5.056	-5.552	-24.303	81	26.223	x	-11.625	-6.687	
VI.	33	-11.025	-6.594	0.155		82	-32.300	1.571	5.807	14.224	
	34	13.011	4.262	2.668	-2.520	83	-61.503	x	-2.126	6.839	
	35	44.864	-9.905	-15.774	-1.803	84	-14.944	1.079	3.561	-3.052	XVI.
	36	x	-2.332	-1.565	-15.436	85	-32.548	-0.342	2.266	-17.331	
	37	-59.108	5.528	x	-6.438	86	x	x	0.663	14.416	
	38	-3.814	2.947	-2.839	-4.275	87	-8.538	13.472	17.327	-23.780	XVII.
VII.	39	19.545	14.339	28.901	16.294	88	x	-5.869	22.007	51.046	
	40	-43.226	-0.030	7.568	0.245	89	x	48.278	64.907	18.202	
	41	-15.661	-1.596	-5.732	0.554	90	-2.950	2.942	-0.685	-26.125	
VIII.	42	x	-5.637	5.293	22.036	91	x	x	0.217	25.674	XVIII.
	43	x	0.368	9.608	-10.016	92	x	x	-1.293	7.827	
	44	-37.023	-3.743	1.172	23.315	93	x	-24.689	-13.386	-5.473	XIX.
IX.	45	x	0.521	x		94	x	-53.477	3.344	16.547	
	46	x	-14.796	x		95	x	5.557	8.581	42.740	XX.
X.	47	x	1.639	x	0.174	96	-39.572	x	6.352	7.612	
	48	27.243	-2.424	-2.423	24.796	97	x	6.855	70.994	65.480	XXI.

Source: own calculation

Summary and Conclusion

In this thesis, I have analyzed some specific issues of international trade. By studying the causes and implications of trade policies, I tried to contribute to the ongoing strand of the literature on international trade policy. I studied empirically specific determinants of trade protectionism and trade conflicts. In addition, I analyzed the implications of tariff and non-tariff measures on international trade. Moreover, I constructed a theoretical framework offering the cost-benefit analysis on the policy implications of prohibitive non-tariff measures (NTMs).

In the first chapter of the dissertation, I have analyzed some specific determinants of trade protectionism. Grossman and Helpman (1994) constructed a framework for "protection for sale." Their main argument was that governments might impose trade policy restrictions in favor of special interest groups. These groups are mainly domestic producers benefitting more from higher prices and/or lack of competition. Hence, the government might assist them by limiting imports of products from their competitors. On the other hand, these groups will support the government (specifically political coalition and parties) on the election campaigns. The protectionism will hence increase frictions and restrictions in trade, which can frequently be in contradiction with commitments undertaken in international trade agreements. This process might intensify in a country with high corruption. In other words, a corrupted society can have additional incentives to implement protectionist measures. In the first chapter, such relationship is tested empirically during the period of 1996-2011.

I analyzed the impact of corruption on trade protectionism and trade flows using a panel database of all countries in the world. To achieve robust results, I included control variables in the regressions applying Fixed Effect, Random Effect, and Generalized Method of Moments techniques. As a proxy of trade protectionism, I used customs and duties on imports, and taxes on trade. For trade flows, I used general openness indicator, which is calculated as a total trade to GDP ratio. In addition, I considered total imports, imports of goods, imports of services, and some other sub-categories of imports. Analyzing two measures of corruption from two different sources, I did not find any consistent and robust relationship between corruption and trade protectionism. The same result was concluded for the impact of corruption on trade flows. Overall, I concluded that I did not find that this institutional quality has significant impact on aggregate trade flows or overall trade protectionism. Special interest groups are usually lobbying the governments for their beneficial sectors of interest. The competition between corrupted special interest groups in different sectors is not identifiable in the measures used in the analysis. What observed in this chapter is actually the impact of average corruption on the aggregate trade protectionism. Hence, the summation of such effect on total protectionism is statistically zero. As a future avenue of research on this issue, the role of sectoral corruption in trade needs to be analyzed.

In the second chapter of my dissertation, I establish a theoretical framework to investigate the implications of a specific trade policy. In fact, I provided a cost benefit analysis within a partial equilibrium framework to evaluate impact of a prohibitive NTMs. Technical Barriers to Trade (TBTs) are one of the major sub-categories of NTMs, which have been used more frequently

since tariffs have been bounded by the WTO schedules of commitments. However, WTO regulations allow for specific, legitimate motivations behind impositions of such policy measures. Legitimate reasons behind such regulations can be for instance the pursuit of health and environmental issues or market efficiencies. Justifiable reasons related to concerns of the consumers' health hampering the import of harmful products are the main components of my theoretical framework in the second chapter.

The framework is established for a society in which two types of products are available: one is produced domestically without any harm to health, and the other is imported from abroad, with possible negative attributes. I assumed that there were two groups of consumers in the society imposing the prohibitive NTM. One group is completely indifferent about the harmful characteristics of the foreign product. The other group is very concerned about the possible harms of the foreign product receiving a disutility from its consumption. Moreover, I proposed two scenarios differing from each other in the sense that consumers can either or not distinguish between the two products in the home market. After utility maximization of consumers, and profit maximization of the two industries I calculated the quantity, price, and welfare of consumers and producers in the Cournot model of competition. Then, I analyzed welfare changes after the imposition of a prohibitive NTM banning the imports.

The conclusions from theoretical framework were illustrated using data on consumption of shrimps within the EU-15. The results suggested that when consumers distinguish between the origins of products, a prohibitive NTM decreases their welfare less than when they have no information about the origin of products. In contrary, gains of domestic producer are smaller when there is incomplete information in the market. However, considering relative changes of welfare with respect to the ex-ante policy imposition, availability of information works more in favor of consumers than producers. Therefore, it can be stated that dispersing the information to consumers about the existing harmful products in the market can be treated as the good faith of government for imposition of NTM.

The third chapter was analyzing the impact of NTMs on the quality of the imported products. International agreements classify NTMs based on the legal and procedural issues. However, scholars take one-step further and classify NTMs on their implications. Some NTMs contain regulations and standards to increase the quality of imported products. In the former chapter, I was also addressing various motivations and causes of NTM impositions. Prohibiting the import of low-quality products was addressed in the second chapter. Quality issues are frequently aimed by TBTs and SPS measures that are extensively used since 1995. Nevertheless, we still find some qualitative measures within other types of NTMs such as safeguards. Hence, the main focus of the third chapter was dedicated to analyze the quality improvement of products induced by different types of NTMs.

Anti-dumping (ADP), TBT, SPS, Specific Trade Concerns raised on TBT and SPS, and all other quantitative measures (i.e. QNTM including countervailing measures (CV), safeguards (SG), quantitative restrictions (QR)) are the six types of NTMs analyzed in the fourth chapter. The data on these NTMs are gathered from the WTO Integrated Trade Portal (I-TIP), which was extensively improved by Ghodsi, Reiter, and Stehrer (2015). Lacking a good measurement

for quality of imports, previous studies were using imports unit-values as proxies for quality. However, using a theoretical framework proposed by Feenstra and Romalis (2014), we disentangle the quality and quality-adjusted cost of production within the unit-values. Then, the impact of NTMs on trade values (c.i.f. and f.o.b.), quantities, unit-values, quality, quality-adjusted price, and quality-adjusted quantity was analyzed in the fourth chapter.

The results of chapter three point at diverse impact of different types of NTMs on various sectors of products. Overall, TBTs are found to be trade enhancing, especially for chemicals, machineries, and other manufactures; and to be quality improving except for crude materials and inedible. We find that SPS and QNTM are trade restrictive and have diverse impact of SPS on quality of imported products is observed across different sectors. The surprising result refers to the ADP, which has trade enhancement in most of products and quality downgrade and increase in cost-related price. This result indicates that exporters dumping to the importing market with lower price, downgrade the quality of their products in order to comply with the lower prices petitioned by the anti-dumping. Moreover, quality-adjusted price is increased by the ADP to achieve its goal.

The fourth chapter of this dissertation is dedicated to trade conflicts within the WTO involving TBTs. The main goal of this chapter is to find possible linkages between the TBT notifications and the Dispute Settlement (DS) cases of WTO citing TBT agreement. Specific Trade Concerns (STCs) on TBTs are the focus of the analysis. While WTO members can impose TBTs based on justifiable motivations, other countries are allowed to raise STCs on TBTs within a reverse notification system. The interesting issue behind these STCs is that they are raised because of perceived restrictions on trade. In this chapter, a descriptive analysis on TBT STC database is provided. Weaknesses of this data, provided by the WTO secretariat were elaborated in details. Various duplications of notifications within the databases can be mentioned as one of the major shortcomings of this data.

In addition, a short description of DS cases citing TBT agreement is presented in the fourth chapter. European Union and the USA are the major countries responding to 20 and 11 Dispute cases respectively. Long and time-consuming disputes are discussed here. These long procedures not only impose costs on the DS bodies of the WTO, but also exporters incur high costs facing discriminative policy instruments. Another interesting feature is that only 5 out of 45 DS cases during 1995-2011 are interpreted as violations of TBT agreement.

The linkages between STC notifications and DS cases were analyzed statistically and econometrically. We find traces of DS cases in some of the TBT STC notifications. Moreover, we tested relationship empirically by merging the TBT STC data with compiled DS cases database covering the affected products. In a bilateral trade relationship model, the number of DS cases citing TBT agreement on products is thus considered as the dependent variable. The TBT STC raised on product is included in the regression as the main explanatory variable. According to the standard strand of literature, some control variables are also included in the regressions. Fixed effect Poisson estimation is applied in order to achieve unbiased and robust results for the regressions on count dependent variable. The outcomes show the significant

positive relationship between the TBT STCs and DS cases. In other words, we find that TBT Trade Concerns can be treated as early warnings for DS cases.

The fifth chapter of the thesis focuses on trade in services. While many efforts have been made to increase the trade liberalization between the EU member states, we observe numerous trade restrictions in services. The first goal of the analysis is to evaluate the trade liberalization and its impact on trade of rail transportation services within the EU. In order to achieve this goal, bilateral trade in subsectors of rail transportation is analyzed within a gravity model. Four different liberalization indices are the main explanatory variables included in separate estimation specifications, in addition to some control variables. Only one of the indices, quantifying legal requirements for market entry and to the extent of the support of the regulatory to the external Railway Undertakings, is demonstrated to have statistically significant positive impact on trade flows of this service within the EU.

Second goal of the fifth chapter is concentrated on the calculation of tariff equivalents of trade policy restrictiveness in the railway transportation sector within the EU and some other OECD countries. Following the approach used by various scholars (Park, 2002; Francois et al., 2005; Walsh, 2006), tariff equivalent is calculated within a cross sectional gravity framework during 2003-2010. Including various control variables in the regressions, the country with the lowest difference between its predicted and actual average level of import in each year is considered as the benchmark country with highest level of trade liberalization. Thus, other countries' trade restrictive can be listed based on their relative distance from the benchmark country.

In spite of three rail liberalization packages adopted by the EU member states, there is no statistically significant decreasing trend of restrictiveness based on calculated tariff equivalents. However, for some countries such as Germany, liberalization has deepened during analyzed time span, while for some others such as Turkey or Poland the situation has been worsening. Moreover, an opposite relationship is observed between the liberalization indices and tariff equivalents. In fact, countries such as Great Britain, Denmark, Sweden, or Germany with high liberalization indices have low estimated tariff equivalents.

The last chapter of this dissertation is providing the ad-valorem equivalents (AVEs) of NTMs. Former chapters of this dissertation discussed various impacts of NTMs across countries, products, and times. This concluding chapter gives a detailed implication of NTM types maintained by WTO members on products at the six-digit of Harmonized System (HS) during the period 2002-2011. Kee et al. (2009), Beghin et al. (2014), and Bratt (2014) calculated AVEs of NTMs. The shortcomings in their studies are resolved in the analysis of the sixth chapter of this thesis. The shortcomings are as follows: (1) using a cross section for the period average 2001-2003; (2) no differentiation between the types of NTMs; (3) no observed intensity of NTMs; and (4) no variation in the effect of NTMs on each product across countries. The empirical strategy applied in the last chapter is over a panel database covering bilateral trade flows between all WTO members as importers and all their trading partners in the world. ADP, TBT, SPS, and QNTM (elaborated above) are the four types of NTMs used in this analysis, which can differentiate the diverse effects of NTMs. Moreover, instead of a dummy variable (which was used in earlier studies), number of imposed NTM is used indicating the intensity of

trade policy on a given product. More importantly, the empirical strategy provides importer-specific impact of NTMs that varies across countries.

In the first stage of the empirical strategy, the impact of each type of NTM by its imposing country on the import values of the given product is estimated. Then, using the import demand elasticities, the effect is transformed in to price effects giving AVEs for each importer-specific NTM. The calculated AVEs show both impeding and enhancing behavior of different types of NTMs, by different countries, and by different sectors. The highest trade restricting effects are found for chemicals, metals, textiles and vegetable products, due to TBT and QNTM measures. Highest trade impeding effects are found in the agricultural sector for final consumption goods affected by antidumping and other quantitative measures. TBTs and SPS measures seem to hamper trade in the manufacturing sector, but rather foster trade in the agri-food sector. Finally, TBTs are the only NTM type that is found to complement tariffs for final consumption goods, while SPS measures serve as substitutes to tariffs for gross fixed capital formation, other quantitative measures work as substitutes for intermediate products and ADP features prominently as substitute to tariffs for every BEC category

As an overall conclusion for this dissertation, I can state that protectionism is still important, especially in the form of NTMs and it is poorly explored in the case of services. Significant necessity of trade liberalization is emphasized in the economic literature. Governments and societies are aware of the benefits of open markets and trade liberalization. However, debates around the current negotiations on the Transatlantic Trade and Investment Partnership (TTIP) indicate that consumers fear lower quality of products in addition to unprecedented events induced by such partnership. On the one hand, there is an anxiety and fear for lowering the standards in the two large economies – the USA and the EU covering around 45% of world GDP – for freer trade. On the other hand, a big change like TTIP has its social anxieties whose consequences are not observable for consumers. Nevertheless, for some specific reasons, either economic or non-economic ones, governments impose restrictions on trade flows. Even the EU does not enjoy a complete liberalized trade – as observed in the fifth chapter. Yet, there is a downward trend in protectionism policy instruments, such as lowering tariffs since GATT and WTO establishment. However, variety of trade measures such as NTMs and restrictions on services trade, raise concerns on these constraints banning the liberalization in trade. Elevated conflicts between WTO members due to these restrictions inducing high international costs are other issues related to trade protectionism, which should be studied in more details in further researches. Combined further studies of legal and economic related issues in trade are required to pursue the ultimate goal of achieving trade liberalization globally not only trade in goods but also in keeping pace with supply chains. Although such an aim has currently many obstacles on its way, having a liberalized trade at near point in time is not impossible.

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Trade Policy, Trade Conflicts, Determinants, and Consequences of Protectionism

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Status of Chapters

Chapter	Status
Chapter 1	**Published**: Ghodsi, M. M. (2013). Corruption and the Level of Trade Protectionism. Ekonomia. Rynek, Gospodarka, Społeczeństwo, (30), 75-96. Authorship share: 100%
Chapter 2	**WNE UW Working Paper**: Ghodsi, M. M. (2013). Welfare Analysis of a Prohibitive NTM in a Society with a Proportion of Concerned Consumers (No. 2013-12). URL: http://www.wne.uw.edu.pl/inf/wyd/WP/WNE_WP97.pdf Authorship share: 100%
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